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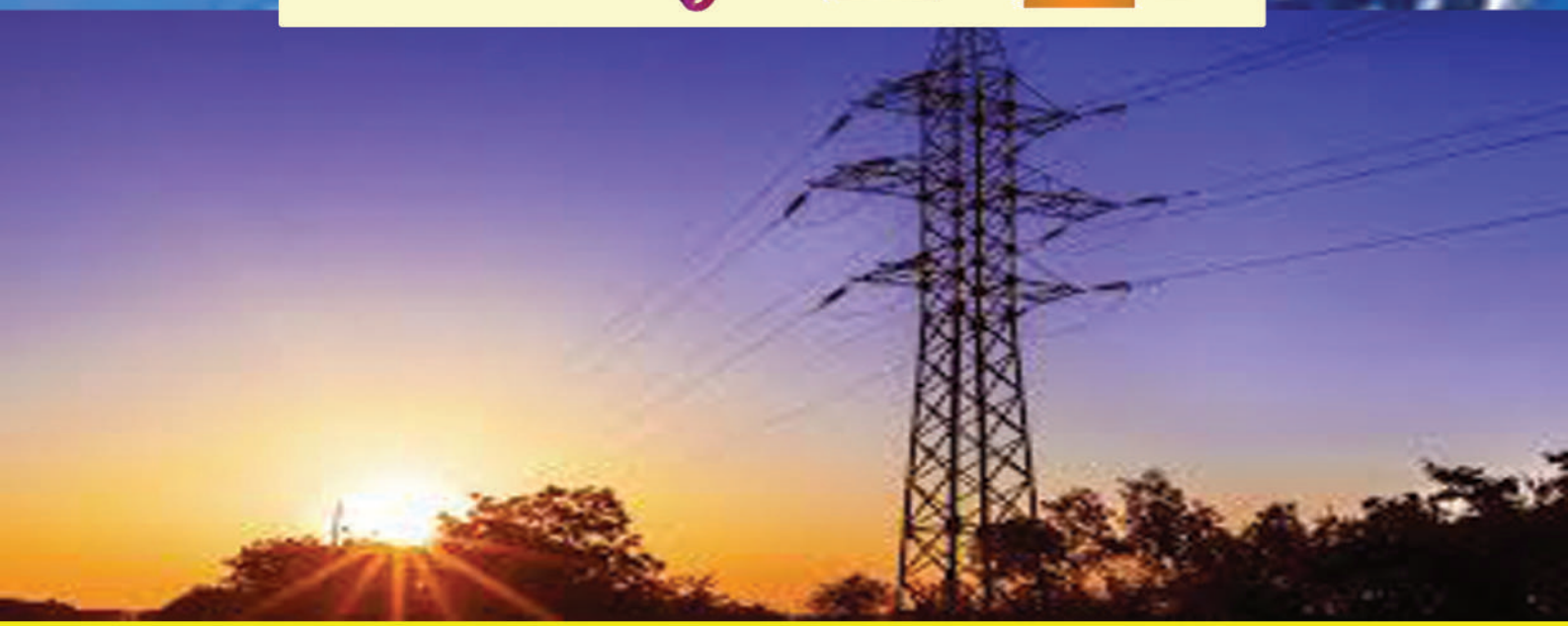

K.L.N. COLLEGE OF ENGINEERING

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Pottapalayam -630612,Sivagangai District,Tamilnadu

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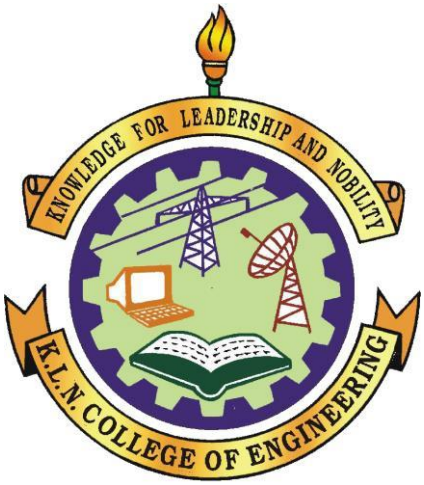
INspirational **S**cripts, **P**ersonalities and **I**nnovative **R**esearch of **EEE**

VISION

To become a high standard of excellence in Education, Training and Research in the field of Electrical and Electronics Engineering and allied applications

MISSION

To Produce excellent, innovative and Nationalistic Engineers with Ethical values and to advance in the field of Electrical and Electronics Engineering and Allied Areas



K.L.N. College of Engineering

Pottapalayam – 630 612, Sivagangai District, Tamil Nadu, India

INDEX

MESSAGE FROM HEAD OF THE DEPARTMENT

In this issue articles on the most recent topics presented by the student Electrical vehicles are desired of the future economic of our country.

A Briefly note on this presented opportunity are very high on this field.

Some of the articles guide lines for technical paper written in presentation. Once work will be appreciated only when it is presented well. As the paper will be presented in the National/International forum, special care should be taking before publishing in the articles. The recent fire accident hospitals and temples required more precaution measure to be taken to safe guards. Our loved only and properties and document protected for long period of time. Examination reforms and challenges will definitely improve the confidence of the student.

Best Wishes

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SOLAR POWER FOR ATMS

G.R.AKSHAYA 172307- III YEARS / VI Sem / A Sec

I. INTRODUCTION

The need for clean and green energy such as solar, wind, bio-mass, fuel cell *etc.* are increasing because of their pollution free property. In Indian peninsula electricity is yet not reached to every place, also there is huge deficiency in electricity supply. Due to shortage or unavailability of electricity there is limitation of use of modern facilities suchas ATM centers, computers *etc.* Though the number of renewable energy sources are available Solar Energy is best suitable for Indian peninsula as it gets natural sunlight nearly for whole year. It is also suitable for remote areas to feed offgridloads. This paper suggests the standalone Solar PVsystem for ATM center where grid is not available. But the main issue is all connected load is in AC form and the output of solar PV system is in DC form. For this it is necessary to convert DC into ACIn India for single phase rated voltage is230 volt, 50 Hertz. To get 230 V, 50 Hz ac output the inputvoltage required is 360 V to 400 V DC.

But available solar panel output voltages are up to 36 V and for batteries that are used for this low power application the voltage level is up to 48 V . So to achieve the DC link voltage which is in the range of 360 V to 400 V for input to the inverter, the following different techniques are used conventionally:-

***1)*By use of Three dc-dc converters:-**

As input is up to 36 V and output require is of 360 V to 400 V, the voltage gain require is of around 10 times. Single dc-dc converter gives maximum 3 to 4 times of input voltage. So the string of three such converters is connected in series to achieve the required voltage gain. Because of use of multiple converters efficiency of the overall system reduces drastically and also reliability reduces

2) By use of Higher PV and Battery Voltage:-
Because of use of higher voltage of PV and battery the required gain of dc-dc converter reduces but for low power off-grid system the issue of installation as well as safety of system is main problem. To get PV output high number of panels connected in series increases. Also numbers of batteries connected in series increases which increase the cost and size of system.

3) By use of Boost Inverter:-
In this the input required to inverter is low and it gives.required high output voltage. There is no need of high gain dc dc converter. But in this complex control requires capacitor experiences high voltage and also the stress.

4) By use of step-up transformer:-
In conventional inverters which are currently in use for domestic applications, step-up transformer is used. The low voltage ac which is obtained from inverter is stepped-up with the use of specially designed step-up transformer. But as primary voltage of transformer is very low and current is very high the size and cost of transformer increases. So to overcome above problems in current topologies, in this paper Buck-Boost Integrated Full Bridge Inverter (BBIFBI) is used and also it doesn't need bidirectional dc-dc converter for battery connection. Thus overall system is simple to design, control and install without any concern of safety.

II. WORKING OF BBIFBI

In whichfour switches M1, M2, M3, M4 are used as like traditional fullbridge inverter along with that capacitor $C_i$is connected inbetween input supply and switch M1. Inductor L_i and diode Dis connected in between L_L and C_L are the filters connected at the load. C_i, M1, M2 and V_{in}shown in dotted line forms the buck-boost converter. Switch M1 and M2 works in dc-dc conversion and also in inverter operation. Input of buck-boost converter is $V_{in}$and output is V_{ci}. The total effective dc link voltage is divided in V_{in} and V_{ci}. The voltage stress across the $C_i$reduced considerably and also voltage gain required from dc-dc converter reduces. In this case as application is ATM which operates 24x7, so load is assumed constant and continuous. System operates in both Continuous Conduction Mode (CCM) and Discontinuous Conduction Mode (DCM) otherwise inductor requires is too large or too small.

A. Operation in positive half cycle

For positive half cycle polarity of output voltage is fixed. So switching sequence is M1M4-M4M2-M1M4-M1M3.

For CCM:

i) State I:-
In this state only M1 and M4 are on. Capacitor C_i starts charging when $i_i(0) > i_L(0)$ through diode

D1 and switch M4 up to $i_i = i_L$. When $i_i(0) < i_L(0)$, $C_i$starts discharging through M1 and M4 and energy stored in inductor L_i is supplied to the load.

ii) State II:-
In this state M4 and M2 are on. When $i_i(0)$ is greater than $i_L(0)$ current in L_i increases and L_L decreases through switch M4 and M2 When $i_i(0)$ is less than $i_L(0)$ current in both L_i and L_L decreases and D2 and M4 conducts.

iii) State III:-
In this state M1 and M4 are on. This condition is same as stat I i.e. when $i_i(0) > i_L(0)$ capacitor C_i charges up to $i_i(0) = i_L(0)$ and when $ii(0) < i_L(0)$ it discharges.

iv) State IV:-
In this state M1 and M3 are on. $C_i$charges though current through L_i decreases. When $i_i(0) > i_L(0)$ diode D1 and D3 conducts else M1 and D3 will conduct.

1)For DCM:

The $i_L > 0$ for some part and zero for some part over the switching cycle during DCM operation of converter. When $i_L > 0$, the situation is same as CCM case. When $i_L$is zero diode D reverse biases and inverter opearates same as standard full bridge inverter.

B. Operation in negative half cycle
For negative half` cycle switching sequence is M3M2- M4M2-M3M2-M1M3. In first state M3 and M2 are on, inductor current increases and capacitor discharges. For other states the operation is same as in case of positive half cycle.

A. For CCM:
Equation for capacitor voltage $V_{ci}$is given by Average voltage across inductor L_i=0

Vci=duty ratio of M2/1-duty ratio of M2 Vin
Where,
Vin= input voltage

Duty ratio=1-Msin(wn)/2 (2)

Where, M- Modulation Index for unipolar SPWM

B. For DCM:
Equation for capacitor voltage Vci is given by (3),

Vc=Vin^3(1+M^2/2)/8PiLiFs-Vin^2(1+M^2/2) (3)

Where, M- Modulation Index, P_L-Load Power Fs-Switching Frequency

III. Overall Structure Of Solar PV For ATM Machine

The load considered is Ecoteller ATM manufactured by Vortex India, which has maximum rated power of 75 watt. The lightening load of 25 watt is considered. Thus total load is 100 W. ATM operates for 24x7. So daily load is 2400 W-Hr (days of autonomy is not considered). Daily sunshine hours assumed is 4 hrs with 1 kW/m_2. So panel size is of 600 W. The output voltage of solar panel is chosen at 36 V. Batteries are chosen such that overcharging or over discharging is avoided. Three batteries each of 12 V, 110A-hr are connected in series to form 36 V, 110 A-hr rating Batteries are connected inbetween solar panel and boost converter as shown, for battery charging and discharging separate switches are used. According to power output of solar panel the switches are controlled. Diode is used to avoid reverse flow of current. Battery is charged at 14A. Separate charger is used for this. Output of battery is connected to boost converter.

Thus only one boost converter is used which reduces system complexity and overall system is simple. The input of boost converter is 36 V; the maximum output voltage obtained is 120 V. It is designed to operate in between 60 V to 120 V it is connected to BBIFBI. BBIFBI is designed such that the input dc voltage require is in between 60 V to 120 V and the output voltage is 230V at 50 Hz. Input dc requires to the inverter is in between 360 V to 400 V for SPWM. Capacitor voltage is controlled at 300 V so input requires is in between 60 V-100 V. Thus there is no need of bidirectional dc-dc converter for battery connection. Thus bidirectional dc-dc converter for battery connection is not needed .

IV. System Operation And Control

In this system the load is of just 100 W and solar panel rating is of 600 W. So MPPT algorithm isnot used. There are different modes of operation non-MPPT, battery only mode,shut down mode. According to irradiance the solar panel output changes and system operates in following different modes,

A. $P_P = P_L$:
When solar panel power output (P_P) is equal to load power (P_L) then load is supplied directly by solar panel. During this batteryis not charged or discharged.

B. $P_P > P_L$:
When solar panel power output (P_P) is more than load power (P_L) then load is supplied directly by

solar panel. As power output is more than load demand battery starts charging up to $P_{bat(max.)}$ (Maximum capacity of battery). If battery charges more than $P_{bat(max.)}$ then battery may overcharge and damage.

C. $P_P < P_L$:
When solar panel power output (P_P) is less than load power (P_L) then load is supplied partially by solar panel and partially by battery. As solar panel power output is less than load demand battery starts discharging up to $P_{bat(min.)}$.

D. $P_P = 0$:
When solar panel power output (P_P) is zero then full load is supplied by battery up to certain limit $P_{bat(min.)}$.

E. Shutdown mode:
When irradiance is less to fulfill the load demand and battery discharges up to $P_{bat(min.)}$ to avoid over discharging of battery whole system is shut down.As mentioned previously the input dc requires is of360 V to 400 V. So to achieve this, capacitor Ci is controlled at the voltage of 300 V. The input dc is changed from 60 V to 100 V. As maximum require voltage is 100 V, the boost converter is designed such that its maximum output voltage is120 V [11].

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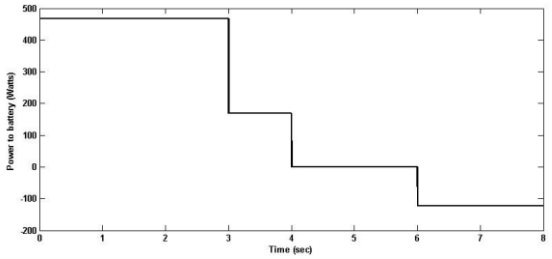
V. SIMULATION RESULTS
The overall system is simulated in MATLAB to check the performance. In simulation battery estimations are not considered. Maximum battery charging current is controlled at 14 A. System is designed as per previously mentioned ratings. The simulation time considered is 10 second. Load is constant throughout the time. Irradiance is changed according to Table1.

battery starts charging. Up to 2.9s the irradiance is 1000 W/m2 so power produced is 600 W. Surplus power produced by solar panel is 500 W, which is given to battery. Then from 3s to 3.9s irradiance is 500 W/m2 so power produced is 300 W then surplus of 200 W is given to battery. At 4s the irradiance is 100 W/m2, producing power of 60 W. To fulfill the load demand additional 40 W is required, which is provided by battery. After 5.9s irradiance is zero so output from solar panel is zero. In this case whole load demand of 100 W is supplied by battery. All above mentioned conditions can be inferred by

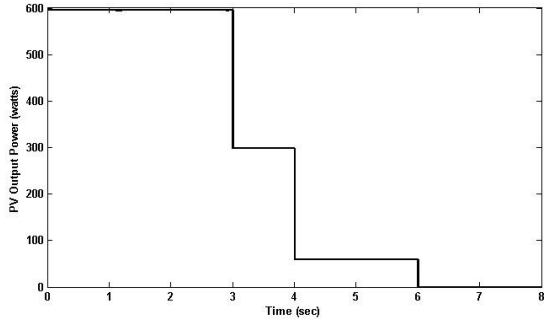
A capacitor voltage is controlled at 300 V, accordingly boost converter output voltage changes. Thus input to BBIFBI is maintained in between 360 V to 400 V. Thus from simulation results it is clearly observed that the system operates in different modes of operation as mentioned previously. The load voltage and current waveforms.

Table1;Irradiance with time used in simulation

Irradiance(W/m^2)	1000	500	100	0
Time(sec)	02.9	3-3.9	4-5.9	6-8

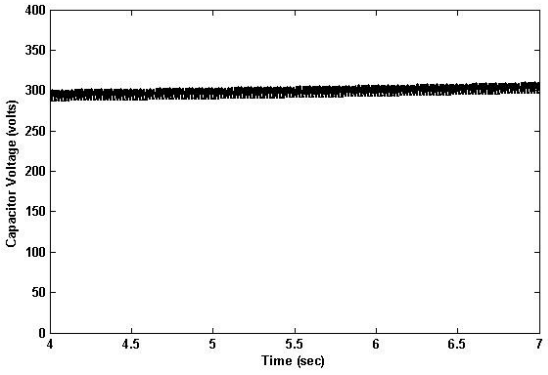


(a)

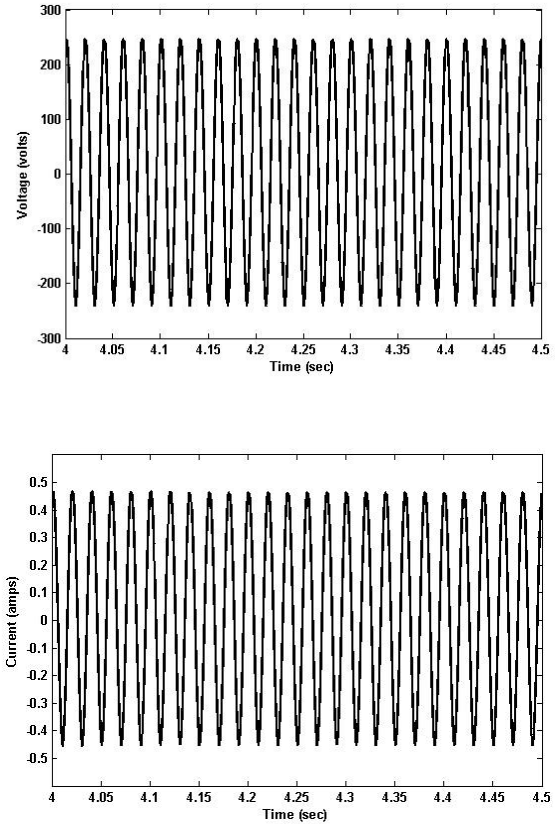


(b)

Simulation result, (a) Power to or from battery,(b) PV output power



Capacitor voltage is maintained at 300V



(b)

Output of load voltage(a) load voltage,(b)load current

VI. CONCLUSION

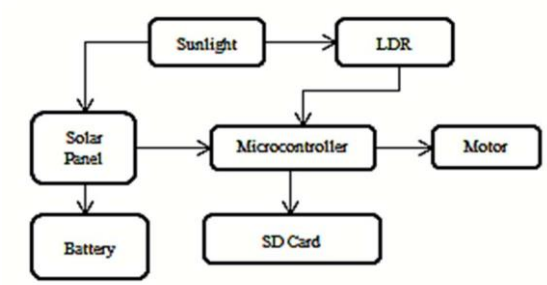
Simulation results confirm that for off-grid solar PV systems such as ATM the 'Buck-Boost Integrated Full Bridge Inverter' is suitable as it requires less number of power conversion stages. The technique used for battery charging and discharging is simple. The resulting system requires less power stages and also don't require bidirectional dc-dc converter. This improves efficiency and reliability of system, though voltage level of PV and battery is low.

AUTOMATIC SOLAR TRACKER

E.ABITHA - 172055 III YEARS / VI Sem / A Sec

I. INTRODUCTION

As the demand for energy is continuously increasing it is imposing an excessive amount of pressure on the existing sources of power generation such as fossil fuels which is leading to high concerns of environmental pollutions and thus pushing society to explore new technologies for producing electrical energy from renewable sources such as wind energy, hydro energy, geothermal energy and solar energy. The most widely used renewable sources are hydro and wind energy, with solar energy being moderately used worldwide. Still, solar energy affords the adequate potential for conversion into electrical energy and hence solar power is an important source of energy. Also with solar power being a highly researched field it has now become a cheap and feasible option With a peak efficiency of 32% and an average efficiency of only 15-20%, maximum efforts should be made to recover energy from the solar power system and hence light gathering losses, inverter losses and storage losses should be minimized. Therefore, an attempt has been made to minimize the losses with the designing, implementation, and evaluation of a compact two-axis solar tracking system along with a graphical and tabular representation of the variation of solar panel voltage from a fixed and dual axis tracking configuration. With the discovery of photoelectric mechanism and subsequent development of the photovoltaic cell (a semiconductive material which is used for conversion of light energy to electric energy). Deriving useable energy from the sun was made possible and hence a DC voltage is being generated which is used across a load [3]. While comparing the two-axis solar tracker to a fixed panel one, a mobile photovoltaic panel which is driven by the solar tracker is better as it gives more precision to the light falling to the geometric normal incident angle. The conversion efficiency of a photovoltaic panel is consistently boosted by the automatic solar tracking system using the light intensity sensing and hence utmost energy is extracted from the sun [4]. Along with solar tracking, various parameters such as temperature and solar panel output voltage are also recorded with the help of an onboard data logger where all the different parameters are being registered after an interval of sun's direction. These registered values are later used for analyzing the efficiency of the tracking mechanism.



Block diagram of the solar tracker with data-logging

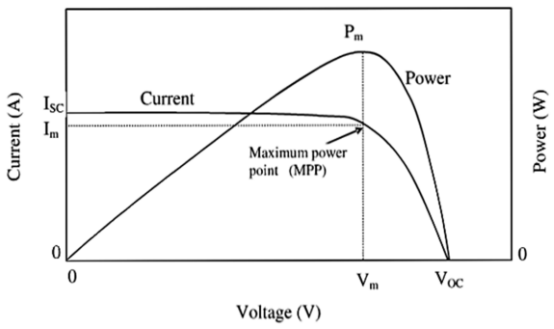
II. V-I CHARACTERISTICS OF SOLAR PANEL

$$Vo = -IoRs + AKT/q.ln[Iq-Io+Isat/Isat]$$

The V-I characteristics of the solar panel are given by the equation . Whereis the generated current, q is the charge, is the shunt resistance, K is the Boltzmann constant,This is the temperature A is a dimensionless factor, I_o is the output current and V_0 is the output voltage.

III. LIMITATION OF FIXED CONFIGURATION

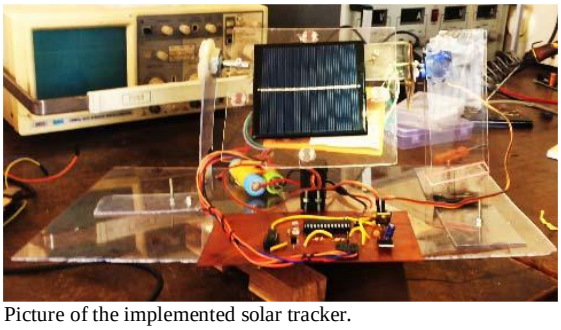
Through the I-V and P-V characteristics of a solar panel in Fig, it can be observed that the maximum output power of a solar panel is obtained when the solar panel is operated close to the knee point. This is done through the method of Maximum Power Point Tracking (MPPT) algorithms. However MPPT can only provide maximum power for fixed position solar panels, it cannot be used when the panel is not oriented towards the sun. Therefore a tracking configuration is developed in order to fully maximize the power output from the solar panel by always aligning it towards the sun.



I-V and P-V characteristics of the solar panel.

IV. DESIGN OF THE PROTOTYPE

A dual axis design is chosen for the solar tracker to enable efficient tracking of sun's position throughout the day. Themovement of the solar tracker in both the horizontal andvertical directions allows the solar panel to be continuously exposed to direct rays of the sun which ensure that output of the solar panel is maximum at all times in a day. Thedata logging part is included to keep track of discharging orcharging voltage of the battery, solar irradiation on the LDRsnecessary for solar tracking the output of the solar panel, and the surrounding temperature. An image of the final setup can be seen in Fig 3.



Picture of the implemented solar tracker.

Four LDRs are used for sensing solar irradiation, which is given as an analog input to ATMega328 microcontroller which controls all the operation of solar tracking and data logging. Two 3.7V Lithium Polymer rechargeable batteries are used to power the circuit. Two servo motors are used to rotate the solar panel in horizontal and vertical directions. IC LM35 is used for temperature sensing which is logged to a memory card. IC-74HC125N is used as a level shifter to shift logic level from 5V to 3.3V as required by the memory card. The final schematicof the controller board is presented in Fig4

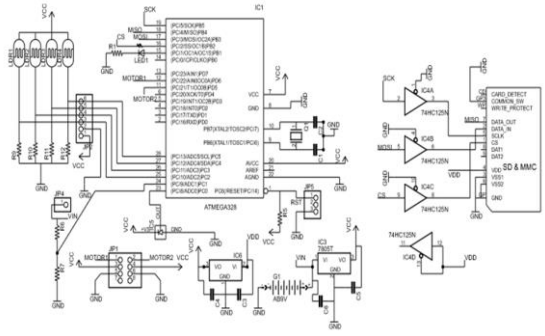


Fig 4. Schematic of the main board and data logging circuit.

B) Construction of the prototype.

The solar tracker frame was constructed using an acrylic sheet of 0.4mm thickness. A rectangular plate with dimension 30cm x 20cm was cut out, to mount the main PCB and a servo motor. This rectangular plate with the servo motor was then mounted onto a sturdy wooden base. This thus formed the part of solar tracker which moves on the horizontal axis. Two strips of acrylic were bent at 1/3rd of their length using heat, forming L - shaped stands and screwed to the rectangular plate. A servo motor was attached on one end and a freely moving axle on the other end. A square acrylic plate, mounted as a base to mount the solar panel, four LDRs and a PCB of the LDR outputs. This base was attached to the servo and free axle on either end to rotate the solar panel in the vertical axis.

V. WORKING OF THE PROTOTYPE

The solar tracker prototype uses an automated calibration and tracking technique to track the position of the sun. The solar panel will obtain maximum energy when the sun is visible to the panels as long as possible; therefore it needs to have an accurate alignment to the sun. The energy contributed through the sunlight drops off if the solar panel is not allowed to alter the direction it faces with respect to the sun's movement
Even though a solar panel that is fixed flat can be collect a high proportion of available noon-time energy, an appreciable amount of power is also available during early mornings and late afternoons when the alignment of the sun with respect to afixed panel becomes too great to collect a reasonable amount of the available energy.

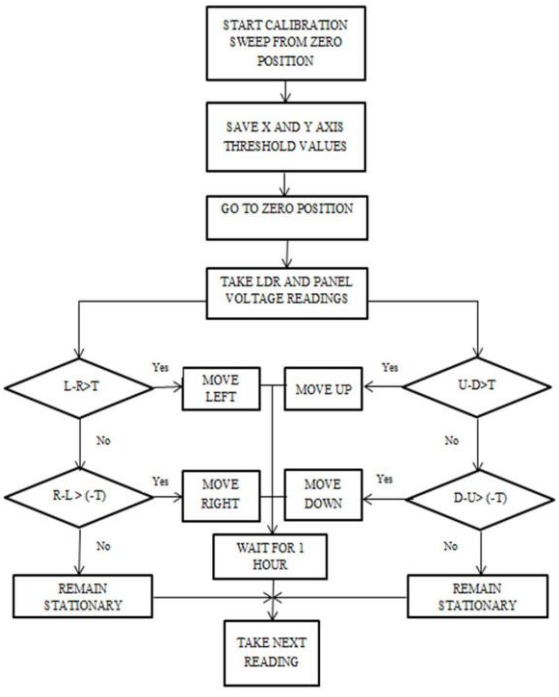


Fig 5. Flowchart of solar tracking algorithm

The working algorithm is illustrated in Fig 5. The solar tracker first takes a calibration sweep and collects readings in all four directions. Then it goes back to its initial position, i.e. facing eastwards. The calibration sweep enables the setup toautomatically adjust to any environment and also improves the solar tracking mechanism. In the algorithm flowchart, the symbols L, R, U, D, and T stand for Left, Right, Up, Down and Threshold readings respectively. The main logic in the solar tracking technique is checking whether the difference in the readings, taken from the LDRs, is greater than the threshold value or not. If it is, the tracker will reposition itself for maximum sunlight, else it would remain stationary. The readings are taken with a one-hour interval in order to maximize efficiency and reduce the amount of power consumed. In addition, the readings are also maintained on a memory card that is connected in the circuit. The readings on the card can then be accessed by an external computer in order to analyze reading such as the surrounding temperature, solar irradiation, and battery voltage. If the readings of all four LDRs fall below a threshold, indicating that it is no longer efficient to track the sun, then the tracker resets back to its initial position and waits for sunrise the next day. Through this method, the tracking system needs little maintenance and supervision and can perform the task automatically.

VI. RESULT ANALYSIS

The solar panel in tracking configuration was observed to be more effective in collecting solar energy over a period of eleven hours as compared to the solar panel in fixed configuration. The readings were taken on 5th May 2016 in Mumbai. The average voltage maintained by the solar panel in fixed configuration was found to be 3.53V, whereas the average voltage maintained by the solar panel in the tracking configuration was found to be 4.815V This is seen in Table 1.

Table 1. Comparison of the Solar Panel Output for Fixed and Tracking Configuration

Time(Hour)	Fixed configuration(v)	Tracking Configuration(v)
08.00AM	3.6	4.2
09.00AM	4.13	4.6
10.00AM	4.86	5.03
11.00AM	5.1	5.2
12.00PM	5.35	5.35
01.00PM	5.35	5.35
02.00PM	4.9	5.35
03.00PM	3.2	5.35
04.00PM	2.6	5.35
05.00PM	1.7	5.08
06.00PM	0.8	3.72
07.00PM	08	3.2

Therefore the average voltage maintained by the solar panel in tracking configuration was 36.3% higher than the fixed configuration. Since the automated tracking configuration was able to keep the solar panel aligned to the sun longer, there was an increased average voltage and consequently increased power output. This shows that the solar panel in tracking configuration was able to output its peak voltage for a longer period of time as compared to the solar panel in fixed configuration. The onboard automatic data logging system made the recording of measurements of battery voltage, solar panel output voltage, and light dependent resistor reading easier as compared to recording measurements manually.

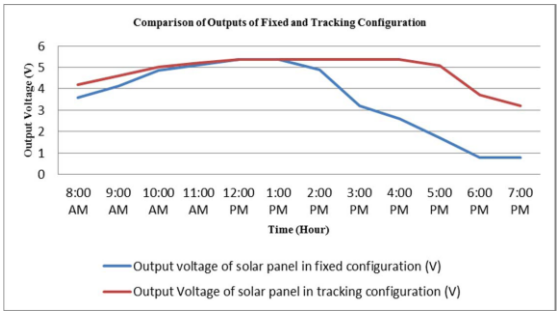


Fig 6. Comparison of solar panel output voltage of fixed and tracking configurations

The comparison of the output voltages between the fixed and tracking configurations is plotted in Fig 6.

VII. CONCLUSION

The automated dual-axis solar tracking system wasimplemented using an ATMega328 microcontrollerprogrammed using the Arduino IDE. This system can be used as an alternate source for household power generation when fitted with a high power rated solar panel. When compared with a fixed configuration set at an inclination of 20o, thetracking configuration showed an average output voltage that was 37% higher. The power consumption of the system is also reduced by using low power modes in between taking readings. The tracking configuration has the ability to replace and improve the efficiency most of the fixed configuration panels. The panel used in tracking configuration was able to maintain its peak voltage for a longer time as compared to thefixed panel thus yielding more solar energy.

GSM-Based Smart Energy Meter with Arduino Uno

B.ALAGU PADMANATHAN - 172027 III YEARS / VI Sem / A Sec

Department of EEE, KLN College Of Engineering, Sivagangai

INTRODUCTION

Smart electrical energy meter technologies have been investigated and developed for approximately 10 years. Various technologies have been developed and used to measure the electrical consumptions. For the billing, the users will get the bill from the energy board after they generated and provided using the several methods. At the moment, most of the residences in Malaysia for example use the traditional electro - mechanical watt meters and the readings are not automated. The users will have to wait the bill of energy consumptions for every month to pay their energy bill. Normally, at the end of the month, a staff from the meter board billing will visit every house to read the meter reading and at the same time, give the bill to the users. An electricity meter or energy meter is a device that measures the amount of electric energy consumed to residence or business. There are two types of Domestic Ordinary Power Consumers meters single phase and three phases. The energy consumption is measured by all electrical services using kilowatt-hours meter with refer to kilowatt-hours (kWh) .

Then electronic meters was introduced with similar function with the electro-mechanical, but it replaces from analog to digital system. With this system users can note down the voltage, power reading unit, current and the time, date of the

energy consumption. This system just gives some advantages over the previous meter reading. After the electronic ones, the meter reading developed with the Bluetooth based technology which is the wireless communication and also known as Automatic Meter Reading (AMR). This system is wireless and the personal computer could be used to record the power consumption of energy meter. The reading meter will be saved to the database and bill will be generated. The latest technology is using a Global System for Mobile Communication (GSM) based system. This system replaces the Bluetooth technology and the data sent using Short Message Service (SMS) to the customer and the energy board.

OVERVIEW OF THE SYSTEM

The System consists of hardware and software part. Figure 1, the hardware parts, shows the block diagram of energy meter project that the users can monitor their home current power consumptions anytime and anywhere. As for the software part, all the program located in Ardiuno UNO, using C language. Arduino UNO, as the main controller, connect energy meter, GSM module, and other sensors/peripherals so they can communicate each other. And Arduino UNO can only work after we uploaded the designed program into it.

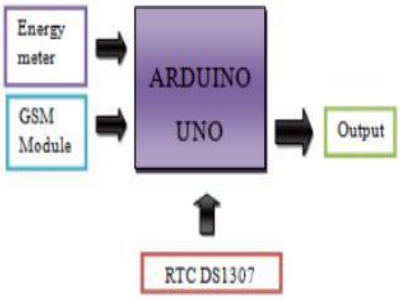


Figure 1: Block Diagram of the System

Hardware System

Automatic Meter Reading system (AMR) continuously monitors the energy meter and sends data on request of the service provider through SMS. It saves huge human labor. The data received from an energy meter has been stored in database server, which was located at the electricity Board station through an SMS gateway for further processing by the energy provider. Automatic meter reading system helps the customer and energy service provider to access the accurate and updated data from the energy meter. AMR System can send energy consumption in hourly, monthly or on request. This data is sent to a central system for billing and troubleshooting. These data are stored into the database server for processing and recording. This technology mitigates labor cost, collection time, energy theft, avoids late payment. Adding to this it increases data security, improved customer service, reduced revenue losses. This system provides freedom for electricity companies to take action against lenient customers who have

outstanding dues; otherwise companies can disconnect the power of customer. This meter use In figure 2 shows the box covered the circuit, only Energy meter and LCD can be seen from the outside. The material for the box is plastic PVC with A4 size and cover with stickers wallpaper. The socket was implementing as a switch between load and the energy meter. So that, 2 lamp can be used as the load. Each lamp can give load for 100W for 1 hours. The LCD display had been place at the top side of the meter while beside the LCD, the LED indicator will blink when counting 1 pulse. The sensor was placed close to the LED at the Energy Meter to catch the blinking when 1 pulse. This prototype might be different to the real product in the future. It must be well arranged without the socket close to the Energy meter and the box should be built with the proper material such as wood or Perspex transparent.

As for GSM, It is the second generation digital cellular system. Digital transmission was used rather than analog transmission in order to improve transmission quality, system capacity, and coverage area. GSM works on three frequencies 900 MHz, 1800 MHz and 1900 MHz To make efficient use of frequency bands GSM networks uses combination of FDMA (frequency division multiple access) and TDMA (time division multiple access) . GSM operators have set up roaming agreement with foreign operator which help users to travel abroad and use their cell phones. GSM module was used for receiving SMS from users mobile phone that automatically enable the controller to take further action like switching ON and OFF electrical applications such as fan, air

conditioner, light and other . The system was integrated with microcontroller and GSM network interface using arduino or other microcontroller and software was utilized to accomplish the integration.

240V AC current and count 1Wh per pulse

In this project, GSM module SIM900 is chosen to use. The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. Define that, GSM module which contain of SIM card and subscription with mobile operator will operate like a mobile phone. The GSM module must be connected to Arduino with TX and RX to pin 2 and 3 respectively. When switch 'ON' the module, the blue LED will be 'ON' and after push the Button Key the red LED will be blinking. That shows the GSM in good condition, but we cannot define the line connected or not until we program the Arduino to test the GSM module.

There are other technologies beside GSM that can act as interface between the energy meters to the users, so that the users can monitor the current usage of their power consumptions. Technologies like Bluetooth and ZigBee are the some of the them. ZigBee is a radio frequency (RF) communications standard based on IEEE 802.15.4. ZigBee is a new wireless communication technology, representing a wireless sensor network which is highly reliable, secure, low data rate, low power consumption, low cost and fast reaction. The Zigbee coordinator is responsible for creating and maintaining the network. All communication between devices propagates through the coordinator to the destination device. The wireless nature of ZigBee helps overcome the intrusive installation problem with the existing systems identified earlier. The ZigBee standard theoretically provides 250kbps data rate, and as 40kbps can meet the requirements of most control systems, it is sufficient for controlling the system. The low installation and running cost offered by ZigBee helps tackle the expensive and complex architecture problems with existing systems. Zigbee enables broad-based deployment of wireless networks with low-cost, low-power solutions. It provides the ability to run for years on inexpensive batteries for a host of monitoring and control applications. Smart energy/smart grid, AMR (Automatic Meter Reading), lighting controls, building automation systems, tank monitoring, HVAC control, medical devices and fleet applications are just some of the many spaces where zigbee technology is making significant

advancements. But the limitation of ZigBee against GSM is the coverage or distance area. Unlike ZigBee that has distance limitation up to hundred metres, we can find or get GSM signal in almost everywhere. This is the main consideration why we use GSM instead of ZigBee technology. So that the users can monitor their home power consumption from anywhere as long as they have cellular (GSM) signal in their mobile phones. Different frequencies have different characteristics, low frequency tend to have better penetration of particular materials compare to high ones, with the assumption of using same power. Experiment conducted in showed the microwave capability of penetrating material of water to measure moisture contentA microcontroller is an integrated circuit that contains processor core, memory and programmable input and output peripherals. It also known as small computer that designed for embedded applications. On the other hand, the microcontroller incorporates all the features that founds in microprocessor. However, it has also added features to make a complete microcomputer system on its own. The microcontroller has built-in ROM, RAM parallel I/O, serial I/O, counters and clock circuit . The project use Arduino UNO for the microcontroller, The host processor for the arduino UNO is the Atmel Atmega328. The '328' is the 28 bit microcontroller. The architecture is based on Reduced Instruction Set Computer concept which allows the processor to complete 20 million instructions per seconds operating at 20MHz. The ATmega328 is equipped with three main memory section which is flash programmable read only memory (EEPROM), Static random access memory (SRAM) and byte-addressable EEPROM for data storage . The Arduino Uno is the 'standard' Arduino board and the most readily available. It is have 32KB of flash memory, 2KB of SRAM and 1KB of EEPROM memory. With a total of 14 digital I/O pins and 6 analog I/O pins, this is a very capable device, able to run most programs.

The DS1307 serial real-time-clock (RTC) is low power, full binary-coded decimal (BCD) clock / calendar plus 56 bytes. It communicates to Arduino over I^2C connection. A real time clock just act like watch, it use 3V battery and keep time even when no current . Real time clock was used in this project to get the real time counting and storing the bill in the EEPROM. With the real time clock, the bill can be reset at 1^{st} date for every month. It used battery 3V to maintain their life even no current flow.

For light to voltage converter, the TSL257 is combination of photodiode a transimpedance amplifier on a single monolithic CMOS intergrated circuit, it is high-sensitivity low-noise light to voltage optical converter. Output voltage is directly proportional to light intensity (irradiance) on the photodiode

The TSL 257 light to Voltage converter also known as sensor because it detect the light and convert it to the voltage. It is used as interface energy meter to the arduino. It connected to the digital pin at the arduino and declares as digital write output 'HIGH'. When the LED at energy meter blinking, this sensor will sent the voltage to the arduino as a pulse 1. The system also added liquid crystal display (LCD), the display unit that used in this project is a 16 X 2 alphanumeric LCD which consist of 16 characters and 2 lines. It can act as the output display to show the bill, unit and GSM status on the meter.

Software System

Figure 3 shows the flowchart of the program used in the project, developed in C language with the Arduino syntax in the Arduino IDE. The software is also used for loading the program code into Arduino board. In this project, the arduino IDE was used to program, create, debug and upload the coding into the microcontroller. There are parts that need to be program which are digital write input/output, GSM network, Real time clock and EEPROM. Each program need to include the libraries of the coding such as for GSM use GSM.h or SIM900.h and other type of libraries but it depend on the coding requirement. For this project, it used libraries GSM.h, DS1307RTC.h, Wire.h, LiquidCrystal.h, and EEPROM.h

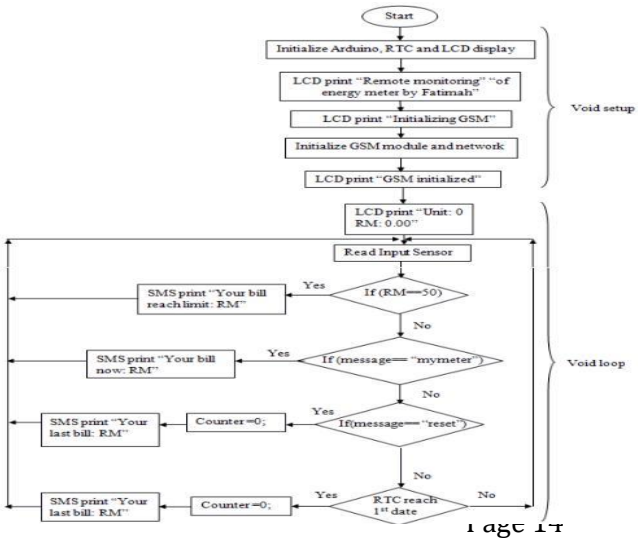


Figure 3: Flowchart of the Program

In the RTC coding, the real time get the time from the laptop for the first time when the program uploaded, and then it will continue as normal watch until we upload the new time. For the EEPROM coding, it writes 2 byte and read back 2 byte the data we write. To save the space, the EEPROM just store the bill for every 30 minutes pulse count and it can store up to 1 Kb. The data will not deleted even the power breakout because EEPROM is non-volatile memory. 'Count' is the unit of pulse for every 1Wh. Figure 4 shows the calculation of bill in 3 conditions. In this project, if the Count is less than and equal to 10, the unit will be multiple with RM 0.22 but in the real tariff for the first 200KWh must be multiple by RM0.218. For the next 100KWh the tariff is 0.334 while the net 300KWh is RM0.516. For this project, the tariff block and the bill range in small scale for simplification.

```
if (Count <=10)
{
  RM = Count*0.22;
}

if ((Count >= 11)&&(Count <=20))
{
  RM = ((10*0.22)+((Count-10)*0.26));
}

if (Count >= 21)
{
                                          //GST 6%
  RM = ((10*0.22)+(10*0.26)+(((Count-20)*0.35)+0.06));
}
```

Figure 4: Bill Calculation Formula

The Real time clock is used as indicator to reset the bill for every month. If the time reaches to the setted time, the Count will reset to zero and start count back the pulse. The SMS will be sent to inform the bill for that month. Another function of GSM in this project is to send SMS to users when the bill reached the limit as figure 5, or user ask a bill anytime or when the users wishes to reset the Count or Unit using SMS.

```
    if((RM >=50)&&(sms_sent==false))

{
sms.beginSMS(phoneNUM);
sms.print("SMS from meterEnergy: ");
sms.print(" \n You reach your limit RM :");
sms.println(RM);
sms.endSMS();
Serial.println("\nCOMPLETE!\n");
sms_sent = true;
  }
```

RESULT AND DISCUSSION

There are two parts that was combined to make the system. The two parts that was combined were circuit for interfacing energy meter to arduino and interface from GSM module to Arduino. Circuit operation was in good condition with the right sequence of program that uploaded into microcontroller. For the light to voltage sensor part, Arduino with microcontroller ATmega238 was used to count the input, calculate the bill and store it into EEPROM. Real Time Clock was used to set the reset counter every month. LED indicator was blinking when input from sensor detected. The value of unit and bill price was display at the LCD display as set in the microcontroller. At the program, the number of mobile phone user was set to receive a message when limit reach. In GSM network, the network plan SIM card was used to transmit message to mobile phone. To combine this two part system, the GSM module Tx and Rx was connected to pin 2 and 3 respectively to Arduino while RTC used analog pin A4 and A5 at Arduino for CLOCK and RS. The other components such as LCD, LED and light to voltage sensor were connected to digital port 4 to 13

Home Automation Using Internet of Things

Arun kumar - 172027 III YEARS / VI Sem / A Sec

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Abstract- *With advancement of Automation technology, life is getting simpler and easier in all aspects. In today's world Automatic systems are being preferred over manual system. With the rapid increase in the number of users of internet over the past decade has made Internet a part and parcel of life, and IoT is the latest and emerging internet technology. Internet of things is a growing network of everyday object-from industrial machine to consumer goods that can share information and complete tasks while you are busy with other activities. Wireless Home Automation system(WHAS) using IoT is a system that uses computers or mobile devices to control basic home functions and features automatically through internet from anywhere around the world, an automated home is sometimes called a smart home. It is meant to save the electric power and human energy. The home automation system differs from other system by allowing the user to operate the system from anywhere around the world through internet connection.*

In this paper we present a Home Automation system(HAS) using Intel Galileo that employs the integration of cloud networking, wireless communication, to provide the user with remote control of various lights, fans, and appliances within their home and storing the data in the cloud. The system will automatically change on the basis of sensors' data. This system is designed to be low cost and expandable allowing a variety of devices to be controlled.

Key Words: Home automation System (HAS), Internet of Things(IOT), Cloudnetworking , WiFi Network , Intel Galileo Microcontroller.

I. INTRODUCTION: A. Overview: Homes of the 21st century will become more and more self- controlled and automated due to the comfort it provides, especially when employed in a private home. A home automation system is a means that allow users to control electric appliances of varying kind. Many existing, well-established home automation systems are based on wired communication. This does not pose a problem until the system is planned well in advance and installed during the physical construction of thebuilding. But for already existing buildings the implementation cost goes very high.

In contrast, Wireless systems can be of great help for automation systems. With the advancement of wireless technologies such as Wi-Fi, cloud networks in the recent past, wireless systems are used every day and everywhere.

B. Advantages of Home automation systems:

In recent years, wireless systems like Wi-Fi have become more and more common in home networking. Also in home and building automation systems, the use of wireless technologies gives several advantages that could not be achieved using a wired network only.

1) Reduced installation costs: First and foremost, installation costs are significantly reduced since no cabling is necessary. Wired solutions require cabling, where material as well as the professional laying of cables (e.g. into walls) is expensive.

2) System scalability and easy extension: Deploying a wireless network is especially advantageous when, due to new or changed requirements, extension of the network is necessary. In contrast to wired installations, in which cabling extension is tedious. This makes wireless installations a seminal investment.

3) Aesthetical benefits: Apart from covering a larger area, this attribute helps to full aesthetical requirements as well. Examples include representative buildings with all-glass architecture and historical buildings where design or conservatory reasons do not allow laying of cables.

4) Integration of mobile devices: With wireless networks, associating mobile devices such as PDAs and Smartphones with the automation system becomes possible everywhere and at any time, as a device's exact physical location is no longer crucial for a connection (as long as the device is in reach of the network).

For all these reasons, wireless technology is not only an attractive choice in renovation and refurbishment, but also for new installations.

III. SYSTEM ANALYSIS

A. Problem Definition

Home automation systems face four main challenges, these are high cost of ownership, inflexibility, poor manageability, and difficulty in

achieving security. The main objectives of this research is to design and implement a home automation system using IoT that is capable of controlling and automating most of the house appliances through an easy manageable web interface. The proposed system has a great flexibility by using Wi-Fi technology to interconnect its distributed sensors to home automation server. This will decrease the deployment cost and will increase the ability of upgrading, and system reconfiguration.

B. Proposed System Feature

The proposed system is a distributed home automation system, consists of server, sensors. Server controls and monitors the various sensors, and can be easily configured to handle more hardware interface module (sensors). The Intel Galileo development board, with built in WiFi card port to which the card is inserted, acts as web server. Automation System can be accessed from the web browser of any local PC in the same LAN using server IP, or remotely from any PC or mobile handheld device connected to the internet with appropriate web browser through server real IP (internet IP). WiFi technology is selected to be the network infrastructure that connects server and the sensors. WiFi is chosen to improve system security (by using secure WiFi connection), and to increase system mobility and scalability.

IV. SYSTEM DESIGN AND IMPLEMENTATION

A. Proposed Home Automation System:

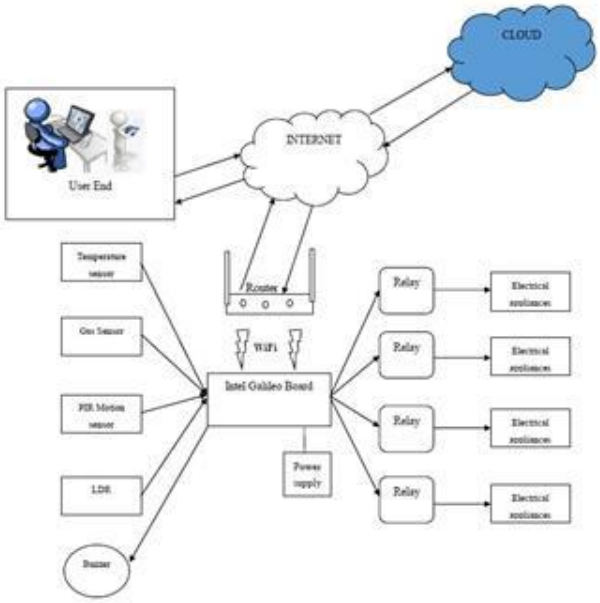

Figure : Proposed model of Home automation system

The proposed model of the home automation system is as shown in the figure1. The model consist of different sensors like temperature, gas, motion and LDR. Initially the Intel Galileo connects to the internet through WiFi. When the connection is established it will start reading the parameters of sensors like p1, p2, p3 etc. The threshold levels for the required sensors are set as t1, t2, t3 etc. The sensor data are sent to the web server and stored in the cloud. The data can be analyzed anywhere any time. If the sensor parameters are greater than the threshold level then the respective alarm a1, a2, a3 etc. will be raised and the required actuation is done for the controlling of the

parameters. In the proposed model the temperature, gas leakage, motion in the house is monitored. The temperature and the motion detection is stored in cloud for analysis. If the temperature exceeds the threshold level then the cooler will turn on automatically and it will off when the temperature comes to control. Similarly when there is a leakage of gas in the house alarm is raised giving the alert sound. The required lights are turned on/off automatically by detecting the light outside the house. The user can also monitor the electric appliances through the internet via web server. If the lights or any electrical appliances are left on in hurry can be seen and turned off remotely through simply typing the IP address of the web server.

B. Proposed Home Automation System Functions

The proposed home automation system has the capabilities to control the following components in users home and monitor the following alarms:

- ✓ Temperature and humidity
- ✓ Motion detection
- ✓ Fire and smoke detection
- ✓ Light level
- ✓ The proposed home automation system can control the following appliance:
- ✓ Lights on/off/dim
- ✓ Fan on/off
- ✓ On/off different appliance

C. Software design

Front End Design:

HTML is a format that tells a computer how to display a web page. The documents themselves are plain text files with special "tags" or codes that a web browser uses to interpret and display information on your computer screen. HTML stands for Hyper Text Markup Language; an HTML file is a text file containing small markup

tags. The markup tags tell the Web browser how to display the page. An HTML files must have an htm or html file extension.

Cloud Storage:

Cloud computing is the practice of using remote servers on the internet to manage, store and process data instead of using a personal computer.

Cloud computing is a general term that is better divided into three categories: Infrastructure-as-a- Service, Platform-as-a-Service, and Software-as-a- Service. IaaS (or utility computing) follows a traditional utilities model, providing servers and storage on demand with the consumer paying accordingly. PaaS allows for the construction of applications within a provider's framework, like Google's App Engine. SaaS enables customers to use an application on demand via a browser. A common example of cloud computing is **Gmail**, where you can access your stored data from any computer with internet access. Here we are using Gmail for the storage of the data.

D. Implementation Setup

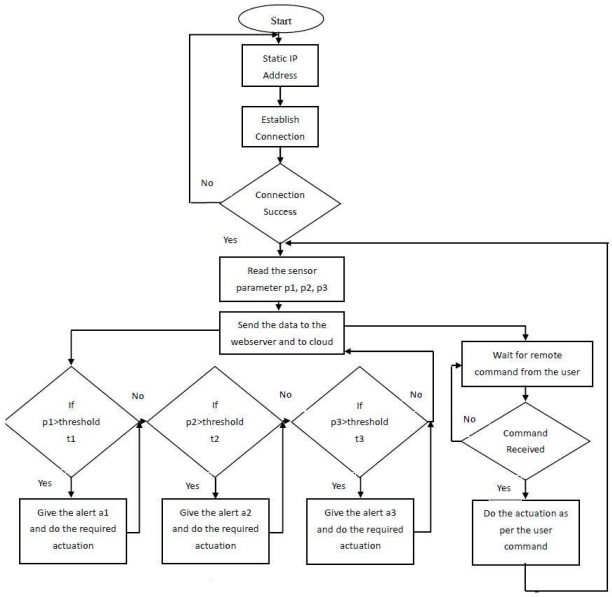

Figure. 2 sequence of activities in WHAS

Figure 2 illustrates the sequence of activities in the WHAS. When the connection is established it will start reading the parameters of sensors like p1, p2, p3 etc. The threshold levels for the required sensors are set as t1, t2, t3 etc. The sensor data are sent to the web server and stored in the cloud. The data can be analyzed

anywhereany time. If the sensor parameters are greater than the threshold level then the respective alarm a1, a2, a3 etc. will beraised and the required actuation is done for the controlling of the parameters.A model house is built for the home automation system and is as shown in the figure 3. At the door of the house a motion sensor is fixed to detect any movement near the door. Light 1 will turn on automatically when light sensor detects the darkness. A cooler/Fan will turn on when the room temperature exceeds the set threshold and in turn reduces the room temperature. The gas sensor MQ-6 is placed in the kitchen to detect any gas leakage, if any leakage is detected the alarm in the hall is raised. Relay is used to switch the electrical appliances like light, fan etc. The Intel Galileo is placed in store room or garage. The Intel Galileo is connected with WiFi card with the antennas for the connectivity with internet.

V. RESULTS

After the successful connection to the server, the data of sensor are sent to the web server for monitoring of the system. The figure 4 shows the web server page which will allow us to monitor and control the system. By entering the assigned IP address in the web browser this web server page will appear. The web server gives the information about the temperature in different places of the house and motion state in the house. It also gives the status of the various electrical appliances like light, fan etc which we can control remotely. All the required data is stored in the cloud (Gmail). The stored data can be analyzed at anytime and anywhere. The figure 5 shows the temperature in degree Celsius stored at different time intervals. And also it shows the state of the motion detector along with the time. It also provides information about time of motion detected and how many times as well. All this information is stored in the cloud which can be checked by the user any time when away from home. The graph shown in the figure 6 gives the analysis of the temperature at different time and threshold level of the temperature. By seeing the graph we can come to know the change in the temperature. And at what time the temperature was low/ high. We can also know that wastemperature was above the threshold level or not, if was above then at what time.

VI. CONCLUSION AND FUTURE WORK:

A. Conclusion:

The home automation using Internet of Things has been experimentally proven to work satisfactorily by connecting simple appliances to it and the appliances were successfully controlled remotely through internet. The designed system not only monitors the sensor data, like temperature, gas, light, motion sensors, but also actuates a process according to the requirement, for example switching on the light when it gets dark. It also stores the sensor parameters in the cloud (Gmail) in a timely manner. This will help the user to analyze the condition of various parameters in the home anytime anywhere

Smart Traffic Lighting System

ARAVIND - 172027 III YEARS / VI Sem / A Sec

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***Abstract* — Traffic light control systems are widely used tomonitor and control the flow of automobiles through the junction of many roads. They aim to realize smooth motion of cars in the transportation routes. However, the synchronization of multiple traffic light systems at adjacent intersections is a complicated problem given the various parameters involved. Conventional systems do not handle variable flows approaching the junctions. In addition, the mutual interference between adjacent traffic light systems, the disparity of cars flow with time, the accidents, the passage of emergency vehicles, and the pedestrian crossing are not implemented in the existing traffic system. This leads to traffic jam and congestion. We propose a system based on PIC microcontroller that evaluates the traffic density using IR sensors and accomplishes dynamic timing slots with different levels. Moreover, a portable controller device is designed to solve the problem of emergency vehicles stuck in the overcrowded roads.**

Keywords—Traffic light system; microcontroller; XBee wireless communication; IR sensor; traffic density

I. INTRODUCTION

Traffic lights, developed since 1912, are signaling devices that are conceived to control the traffic flows at road intersections, pedestrian crossings, rail trains, and other locations. Traffic lights consist of three universal colored lights: the green light allows traffic to proceed in the indicated direction, the yellow light warns vehicles to prepare for short stop, and the red signal prohibits any traffic from proceeding [1].

Nowadays, many countries suffer from the traffic congestion problems that affect the transportation system in cities and cause serious dilemma. In spite of replacing traffic officers and flagmen by automatic traffic systems, the optimization of the heavy traffic jam is still a major issue to be faced, especially with multiple junction nodes [2]. The rapid increase of the number of automobiles and the constantly rising number of road users are not accompanied with promoted infrastructures with sufficient resources. Partial solutions were offered by constructing new roads, implementing flyovers and bypass roads, creating rings, and performing roads rehabilitation.

However, the traffic problem is very complicated due to the involvement of diverse parameters. First, the traffic flow depends on the time of the day where the traffic peak hours are generally in the morning and in the afternoon; on the days of the week where weekends reveal minimum load while Mondays and Fridays generally show dense traffic oriented from cities to their outskirts and in reverse directionrespectively; and time of the year as holidays and summer. Secondly, the current traffic light system is implemented with hard coded delays where the lights transition time slots are fixed regularly and do not depend on real time traffic flow. The third point is concerned with the state of one light at an intersection that influences the flow of traffic at adjacent intersections. Also, the conventional traffic system does not consider the case of accidents, roadworks, and breakdown cars that worsen traffic congestion. In addition, a crucial issue is related to the smooth motion through intersections of emergency vehicles of higher priorities such as ambulances, rescue vehicles, fire brigade, police, and VIP persons that could get stuck in the crowd. Finally, the pedestrians that cross the lanes also alter the traffic system.

The conventional traffic system needs to be upgraded to solve the severe traffic congestion, alleviate transportation troubles, reduce traffic volume and waiting time, minimize overall travel time, optimize cars safety and efficiency, and expand the benefits in health, economic, and environmental sectors. This paper proposes a simple, low-cost, and real time smart traffic light control system that aims to overcome many defects and improve the traffic management. The system is based on PIC microcontroller that controls the various operations, monitors the traffic volume and density flow via infrared

sensors (IR), and changes the lighting transition slots accordingly. Moreover, a handheld portable device communicates wirelessly with the traffic master controller by means of XBee transceivers in order to run the appropriate subroutines and allow the smooth displacement of emergency vehicles through the intersection.

II. Intelligent Traffic Control System

The design of intelligent traffic control system is an active research topic. Researchers around the world are inventing newer approaches and innovative systems to solve this stressful problem. Models based on mathematical equations are applied to estimate the car waiting time at a junction, the number of cars in the waiting queue, the extension of the waiting cars along the lane, the optimal timing slots for green, yellow, and red lights that best fit the real and veritable situation and the efficient combination of routing. In fact, the mutual dependencies between nearby intersections lead to a complicated formulation with cumbersome parameters. These parameters are accidental, hazardous, dependent, and the worse point is the variance of these parameters with time. Thus, finding a dynamic, consistent, and convenient solution is quite

impossible. Researchers from different disciplines are collaborating to explore feasible solutions that reduce traffic congestion. Therefore, various methodologies are constantly proposed in the literature and many techniques are implemented profiting from the technological advances of microcomputers, recent manufactured devices and sensors, and innovative algorithms modeling, as much as possible, the complication of traffic lights.

The IR sensors are employed in numerous traffic systems [3-7]. The IR transmitter and the IR receiver are mounted on either sides of a road. When an automobile passes on the road between the IR sensors, the system is activated and the car counter is incremented. The collected information about the traffic density of the different roads of a junction is analyzed in order to modify dynamically the delays of green light at the lane having the significant traffic volume. The whole system could be controlled by PIC microcontroller [1-2, 4-5] or even by PLC [8-9].

To inform the traffic system about the arrival of the emergency vehicles toward the junction, they are supported by RF emitters [10-12] that send warning signals to RF transceivers disposed at every traffic light intersection. The triggering sequences of the traffic lights are modified correspondingly in order to provide a special route to the emergency vehicles. Other researchers [13] use the Global Positioning System (GPS) to communicate with the traffic light controllers and send preemption signals. The ambulance was equipped with both RF to communicate with traffic light controller and the GSM module to report to hospital doctors about the patient status and to receive messages concerning the kind of therapy or first aid recovery that should be done to the injured patient [14].

Many works [15-16] predict the density of the traffic based on image processing methodology. But these techniques require the acquisition of good images whose quality are weather dependent, especially with the rain and the fog. Other researchers use sophisticated algorithms to model the various states of the traffic such as fuzzy logic [17] and genetic algorithms [18].

Most published works are dedicated to one junction or intersection where the influence of the adjacent intersections is not examined. Thus, the situation becomes more complicated and widely dependent. Further efforts should be made to achieve complete modeling, monitoring, and control for multiple synchronized junctions.

III. System Design

The designed smart traffic light control system corresponds to a junction of 4 mono directional roads in the form of "+" as shown in Fig. 1. We aim in the first place to investigate the technologies of the existing systems and seek the most appropriate employed devices. We try also to test the proposed integrated design as architecture, hardware, and software. Next step will be an extension of the suggested traffic light system

to a bidirectional "+" junction with various routing configurations. Our research target involves the management of traffic light systems for multiple adjacent bidirectional roads.

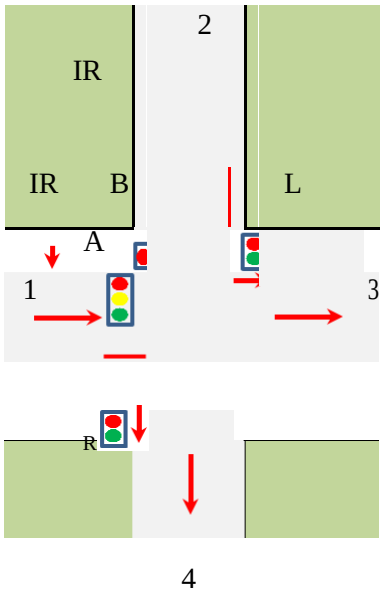


Fig. 1. Intersection of 4 monodirectional roads

The intersection in this primary work is equipped with two traffic lights of three colors, labeled A and B, associated to the car flow coming from roads 1 and 2. Two traffic lights of two colors labeled R and L are integrated to designate the right and left deviation, respectively. Two pairs of IR transmitters and receivers are mounted on either side of roads 1 and 2.

A. Traffic light configurations

In the proposed smart traffic light system, two configurations are presented: the first arrangement allows the flow of automotive from road 1 forwardly to road 3 as well as the turning to the right to follow road 4, while the second one permits the cars to move from road 2 directly toward road 4 or shift to the left to pursue road 3.

The disposition of cars transitions between the roads takes into consideration the crossing of pedestrians. Table 1 illustrates the states of the traffic lights labeled A, B, L, and R during the two configuration modes. The terminology adopted is formed of three fields: traffic light-color lights states. For example, A-G ON designates that the green light of the traffic light A is illuminated. The phase I of the first configuration corresponds to the activation of the green light of the traffic light A and traffic R where the cars parking at road 1 are crossing the intersection. The phase II agrees with the warning for stop position where only the yellow light of the traffic light A is turning on for 5 s. during this configuration, the red lights of the traffic light B and L are ON. In the second configuration, the lights illuminations are reversed.

B. Density traffic light and IR sensors

The major problem of the existing traffic light systems is that the transition timing slots are fixed within the code.

TABLE I. TRAFFIC LIGHT CONFIGURATIONS DURING THE TWO MODES OF OPERATION

First configuration		**Second configuration**	
Phase I	***Phase II***	***Phase I***	***Phase II***
A-G ON A-Y OFF A-R OFF	A-G OFF A-Y ON A-R OFF	A-G OFF A-Y OFF A-R ON	A-G OFF A-Y OFF A-R ON
B-G OFF B-Y OFF B-R ON	B-G OFF B-Y OFF B-R ON	B-G ON B-Y OFF B-R OFF	B-G OFF B-Y ON B-R OFF
R-G ON R-R OFF	R-G ON R-R OFF	R-G OFF R-R ON	R-G OFF R-R ON
L-G OFF L-R ON	L-G OFF L-R ON	L-G ON L-R OFF	L-G ON L-R OFF

A similar system is unable to solve the situation where the traffic congestion is only observed from one direction. This state is frequently detected in many cities where employees from outskirts are driving in the morning to the city downtown and returning home in the evening. In addition, when the flow of cars approaching the intersection roads increases during the traffic peak hours or decreases during night, the green light activation should be extended or reduced respectively. Therefore, IR transceivers mounted on either side of roads are used to detect the passage of cars through it. The IR transmitter generates continuously and regularly a 38 kHz square wave signal while the IR receiver connected to the traffic master controller receives the signal and remains inactivated. When an automobile traverses the road between the IR transceivers, the IR radiation bounces and the system is activated. This activation process is analyzed by the traffic master controller where the car density counter is adjusted. Then, the traffic master controller, which is equipped with PIC microcontroller, responds to the acquired data. Actually, three modes of lighting transition slots are suggested: the normal mode, the traffic jam mode, and the soft traffic mode. The shifting between these three modes is done dynamically and in real time. In fact, the number of counted cars in the phase I of a given configuration affects directly the green light period in the next phase I of the proceeding configuration. The timing slots of the different modes are depicted in Table 2. The three timing slots associated to the normal, jam, and soft modes of traffic are respectively 30, 50, and 15 s. These levels are assigned by the code and can be adjusted by the software. For normal mode, the phase I of each configuration is equal to 30 s. However, if road 1 reveals jam traffic and road 2 shows soft traffic then the period of phase I of the first configuration will be 50 s. In contrast, the period of phase I of the second configuration will be 15 s.

It is noted that during the first configuration, the cars of road 1 are moving to their destination while the cars of road 2 are stacked and parked. Furthermore, when phase II of the first configuration starts, the IR sensor of the road 1 begins the car counting from zero.

C. Emergency vehicles

One of the substantial situations in the traffic light system concerns the passage of emergency vehicles as higher priorities through the roads junction. An emergency vehicle includes ambulances, rescue vehicles, fire brigade, police, and VIP persons that could get stuck in the traffic congestion. This issue may cause several problems that depend on the injury of patient transported, person accident, fire buildings, robbery, and many various critical situations. It is mandatory to implement a technique to solve this predicament.

TABLE II. TIMING SLOTS ACQUIRED BY EACH CONFIGURATION AND

ACHIEVED FOR THE THREE MODES OF TRAFFIC

Traffic Modes	**Configuration**	
	Phase I	***Phase II***
Normal traffic	30	5
Jam traffic	50	5
Soft traffic	15	5

A handheld portable device at the disposition of the traffic officer is proposed in order to command the traffic master controller. Indeed, the portable controller could be adjusted to be mounted on emergency vehicles or implemented in the traffic control center. The portable device is supported by two push buttons labeled EA and EB. The EA button is pressed when the emergency vehicle arrives at the intersection from the side of traffic light A, that is from road 1. Due to this action, the phase I of the first configuration is set and the green light timing slot is shining unlimitedly to provide sufficient time to the stacked vehicle to traverse the intersection. Next, the EA button is pressed again to return to the normal mode, where the yellow light of the traffic light A is ON for 5 s to warn the drivers that

traffic light B will be closely triggered. If the elapsed time exceeds 4 minutes and the EA button is still operating for many causes, the system is automatically actuated and initiates the second configuration. The EB button applied to the traffic light B achieves similar process. If the two buttons are pressed simultaneously, the priority is given to the button EA.

IV. Electronic Components

The circuit of the smart light traffic control system is implemented based on various electronic components that include: the Programmable Intelligent Controller (PIC) 16F877A microcontroller, an LCD display device, XBee transceivers, a pair of IR sensors, push buttons (EA, EB, and 1 to 4), and many colored LEDs that represent the three lights (red, green, and yellow) of the traffic lights A and B associated with the roads 1 and 2 as well as the two lights (red and green) for the traffic light R and L associated with the deflection to the right and left in the direction of roads 3 and 4.

A. Microcontroller PIC 16F877A

The PIC 16F877A [19-23], a family of Harvard architecture microcontrollers made by Microchip, is an integrated circuit (IC) consisting of a simple Central Processing Unit (CPU), RAM, ROM, and EEPROM memories. It contains also clock, timers, A/D converters, and five input/output ports. On the other hand, its 35 instructions make it easy and simple to program. Moreover, its power consumption is low and it has a wide operating voltage range (2 V to 5.5 V) while its input clock operates at up to 20 MHz.

The pin configuration of the PIC 16F877A microcontroller is shown in Fig. 2 where 5 bidirectional input/output ports can be classified as: A is a 6-bit general purpose port which can be also configured as Analog to Digital converter (A/D); B, C, and D are 8-bit general purpose ports, while port E is only 3-bit port. These ports are used to input data that may be generated from keypad, sensor, push button, switch, etc. or to present command signals or data to output devices such as LCD, 7-segment, LED, motor driver, relay, etc.

Each port has its own associated TRIS register. The configuration of these TRIS registers is to select the data transfer direction between the microcontroller and the different peripheral devices through the ports. When a TRIS register is cleared, its corresponding port acts as output, otherwise it operates as input

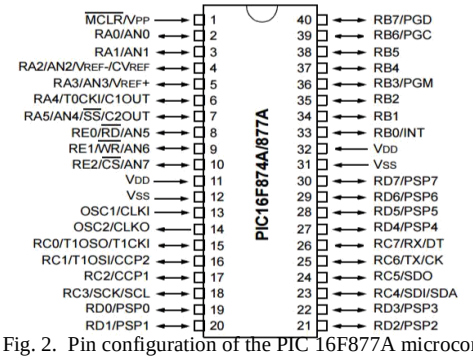


Fig. 2. Pin configuration of the PIC 16F877A microcontroller

On the other hand, many microcontroller port pins can be extended to perform incremental functions and operate specific purposes. The PIC microcontroller is backed up by the Universal Synchronous Asynchronous Receiver Transmitter (USART) module that permits the PIC to communicate with wide range of devices.

B. LCD display

Liquid Crystal Display (LCD) [24] is a power economical, tenuous, flat-panel display, simply programmable, and can be used in many digital and electronic circuits. It employs a matrix structure in which the active element forming the pixel cell is located in the intersection of two electrode buses. Particularly, the 16x2 LCD used in the implemented prototype is able to display data over 2 lines, each of 16 characters.

Actually, two types of registers are used to configure the LCD; the command register is recommended for the control instructions as LCD initialization, clearing the screen, setting the cursor position, and controlling display. While the data register holds the ASCII code

of the characters that are promptly appeared on the display.

C. IR sensor

An infrared sensor is an electronic device implemented to detect obstacles or to differentiate between objects depending on its feature. It is generally harnessed to measure an object heat or its motion [25]. The IR sensor emits or receives the infrared radiations (430 THz – 300 GHz) that are invisible for the human eye. The LED (Light Emitting Diode) may act as an IR emitter while the IR detector is a photodiode component which is sensitive to IR light having the same frequency as the emitted radiation. The concept of operation is simple: when IR radiation of the LED reaches the photodiode, the output voltages change according to the magnitude of the IR light.

D. XBee transceivers

The XBee transceiver module, Series 2, allows creating complex mesh networks based on ZigBee firmware [26]. It admits a safe and simple full duplex communication between microcontrollers through serial port data transfer. The XBee

features (2 mW output, 120 m range, built-in antenna, 250 kbps max data rate, and 8 digital IO pins) are suitable for our objective. Moreover, XBee is supported by point-to-point communication adequate for using one traffic light controller and corroborative also by multi-point network compatible for using multiple traffic controllers. In the XBee configuration, the component connected to portable controller runs as server whereas that linked to traffic light controller fills in the host mode. The XBee characteristics give immunity against interference from neighboring systems and avoid the interaction of closer systems which prohibit the interruption in their services.

V. Hardware Design

The smart light traffic control system is composed of two separate devices: the traffic master controller and the handheld portable controller. Fig. 3 shows the hardware implemented circuit of the smart traffic controller using the Proteus software.

The traffic master controller is mounted with the traffic lights at the roads intersection and is responsible for the lighting transition and their timing slots. Its implemented design circuit includes: the PIC 16F877A microcontroller, the three lights (red, green, and yellow) of the traffic lights A and B associated to the roads 1 and 2, the two lights (red and green) for the traffic light R and L associated with the deflection to the right and left in the direction of roads 3 and 4, the two IR receivers to measure the traffic volume, the XBee transmitter system, and other basic components. The traffic master controller provides the duration and the schedule of the two configurations and their dedicated phases for different modes of traffic. It determines the status of the different lights by commanding the triggered switches connected to the PIC ports. The microcontroller is also connected to IR detectors whose output voltages are responsible of shifting the counter of the cars arriving at the intersection. Finally, the XBee module receives the command orders form the portable controller and calls the corresponding emergency subroutines.

The portable controller commands the traffic master controller by means of XBee transceiver that communicates wirelessly with the other XBee component. A PIC 16F877A constitutes the hardware core of the portable controller. It is connected, in addition to XBee, to the buttons EA and EB that start up the emergency subroutines.

An LCD screen is employed to notify the user if the mode of emergency is operating and which emergency procedure is currently running. We propose also a password of 6 digits formed by the combinations of 4 digits from 1 to 4 in order to supply the portable controller by a certain security level [27]. The total number of arrangements is 4096 possibilities. The role of security code is to prevent unauthorized persons from accessing to the smart light system.

VI. Conclusion and Perspectives

The traffic light issue is obviously a critical problem that worries citizens and governments. The influence of low efficient conventional traffic system affects the economic, health, financial, and environmental domains

ELECTRIC CAR

C.GAYATHRI -172009 III YEARS / VI Sem / A Sec

Abstract—

Large number of electric vehicles (EVs) connected to the grid will have a significant impact on power systems. According to the literature many vehicles are parked over 90% of the usage time. During the parking of EVs, their batteries have a great storage capacity of electricity. Thus, EVs can be used as a distributed energy sources.charging stations for electric cars containing accumulation of electrical energy support. Usually these charging stations are called active charging stations and are parts of modern electrical grid known as "Smart Grids" or "Micro Grids". This paper also contains a brief summary of current knowledge about structures and service of electricity distribution networks, and analysis of electric car industry growth and its potential impact on electrical network.

Keywords—Electric network; active charging station; accumulation of electrical energy; electric car; charging station

I. INTRODUCTION:

Electromobility is currently perhaps the most commonly discussed terms of automotive technology. Low number of vehicles operated in the Czech Republic is also corresponding to the low density of charging stations, most of which are also operated an amateur way. In case of expansion of electric vehicles will also increase the demands on the construction of an adequate network of charging stations. For these purposes seems to be very advantageous to combine the emerging system of infrastructure charging stations with renewable power sources, such as the energy produced by the sun with the possibilities of accumulation and its subsequent delivery to the uniform charging infrastructure

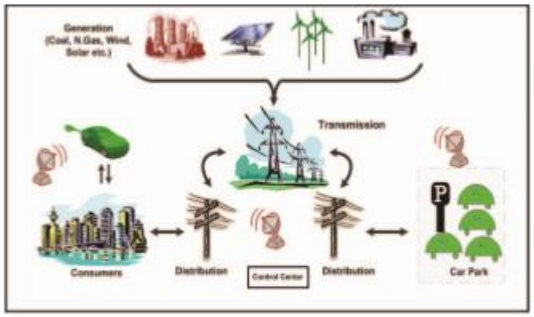


Figure 1. Power system with EVs

A. Estimation of the Electrical Energy Amount Needed for Charging Vehicles :

The amount of electric power consumption can be estimated on the based expected performance structure of the vehicle and their fail safe distances. The energy needed for an average range 120 km of electric vehicles in three distinctivecategories

TABLE I. ENERGY AND SAMPLING INTENSITY IN TERMS OF CHARGING ELECTRIC VEHICLES IN SELECTED CATEGORIES FOR A SINGLE DRIVING CYCLE

Category of vehicle	Stored energy of the vehicle (range 120 km)	Charging current		
		t = 8 hours	*t = 4 hours*	*t = 0.5 hour*
A	13.3 kWh ($W_{akt(A)}$)	5.1 A	10.2 A	81.6 A
B	30.0 kWh ($W_{akt(B)}$)	10.2 A	20.4 A	163.2 A
C	41.1 kWh ($W_{akt(C)}$)	14.2 A	28.4 A	227.2 A

B. Estimation of the Amount of Electricity Needed to Charge the Vehicles in the Region of Ostrava:

The basic premise solutions and designing active networks of charging stations is to create conditions for adequate consumption of electrical energy in repetitive cycles, which can be linked to the cycles of the daily load diagram distribution network. The second prerequisite for successful application of active power stations in the area is its positive effect on the network. The solution must be open enough to allow even the use of non-traditional and renewable energy sources

TABLE II. THE EXPECTED NUMBER OF ELECTRIC VEHICLES IN THE OSTRAVA REGION IN THE PERIOD 2015 – 2020

Category of vehicle	Number of vehicle (%)	Number of vehicle (pc)
A	70	17 500 (N_A)
B	25	6 250 (N_B)
C	5	1 250 (N_C)

III. CONCEPT OF CHARGING STATIONS FOR ELECTRIC CARS WITH MINIMAL IMPACT ON THE SUPPLY NETWORK:

The concept of charging stations must ensure that the energy required for charging electric cars were available regardless of network options, such as at the time of decommissioning the vehicle and its charging even during peak sampling network. Another key requirement for active charging station is the suppression of reverse effects of different types of semiconductor chargers, which will additionally among themselves independently connected to the distribution network at different times of the day.

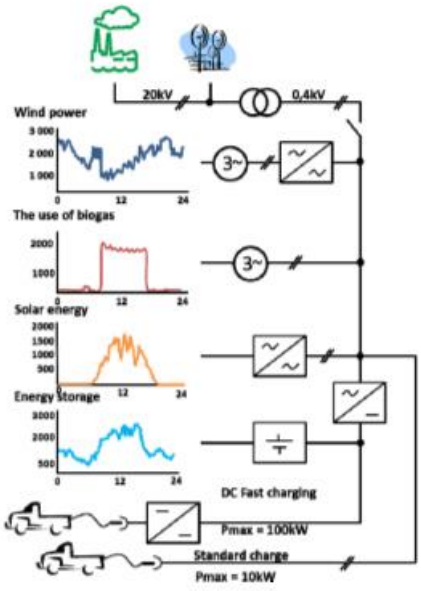


Fig. 3. The integration of active charging station into the structure with the accumulation of renewable sources [1]

The power section of active charging station must, therefore, satisfy the following requirements:• high dynamic management of operating conditions, • four-quadrant operation relative to the grid, • active filtering reversing the effects of electric chargers, • high efficiency of conversion of electrical energy.

CONCLUSION:

The paper deals with active charging stations for electric vehicles in the event of mass deployment. This type of charging stations is not yet used by us, so it's no experience with the operation and impact on the power grid. The purpose is to create such an active station, which is in equilibrium with the opportunities and needs of daily load diagram at the site. Therefore, the whole calculation is based on the needs for continuous cycling of energy in one day.

The solution shows the necessity of using active charging stations. In connection with a suitable geographical distribution of active charging stations in both locations such as location with high density in cities and also in areas that are likely to be implemented in infrastructure between the larger sites, creates new possibilities for managing the operation of distribution network by active charging stations.

SMART GRID AND SMART CITY

J.EVANGELINE PRINCY- 172001 III YEARS / VI Sem / A Sec

INTRODUCTION

Smart energy and electricity networks are a crucial component in building smart city architectures; their consistent and harmonized inclusion in the smart city designshould be carefully considered through a detailed analysis of the impacts (environmental, energy, economic, societal) and the implementation of cost benefit analysis (CBA), not only in terms of managing the grid itself but also in a wider perspective that includes environmental, security, and social aspects. This paper first discusses the main impact that smart grid deployment has, in different respects, in smart cities and then presents a methodology for an extended CBA, able to go beyond the strictly financial aspects. It is based on previous developments at the European level. The methodology conceptually illustrated can naturally be extended to the assessment of proposals for the development of smart cities.

Introduction

Modern cities are becoming more and more dependent on the reliability and effi-ciency of the electrical distribution infrastructure. In the past few years, a greateffort has been devoted to the creation of an integrated infrastructure that combines a resilient power distribution system, distributed generation devices based on renewables (as, for example, photovoltaic panels and wind turbines), a reliable and secure communication system, and real-time energy pricing policies. The resulting infrastructure is called smart grid and constitutes the backbone of the smart city.

"The smart city is all about how the city "organism" works together as an integrated conditions" and, more-over: "the energy infrastructure is arguably the single most important feature in any city. If unavailable for a significant enough period of time, all other functions will eventually cease." Hence, developing and implementing a fully functional smart gridinfrastructure is a priority for future smart cities.In order to implement a smart grid, at least the following three technical domainsmust cooperate, namely: (i) power electronics, (ii) information and communication technology (ICT), and (iii) economics.

THE VISION OF SMART CITIES

There is no unique definition of smart cities, and this paper does not intend to discuss the ones already proposed, or to suggest a new one. The International Telecommunications Union published a report in 2014 citing more than 100 definitions . Cities are central to the discussions on the evolution of society due to the growth of urbanization, with Europe possibly reaching 80% in 2050. (what isknown as electrification of society) .This electrification will have as a necessary companiona ubiquitous network of sensors and communication means capturing and sharing information . The energysystems and the city itself will have to be flexible, adapting tothe different conditions, and anticipating the potential variations in all components and at all levels in the constituent systems

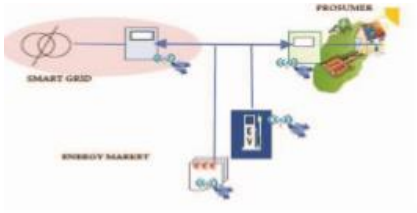


Fig. 1: SG and SA connected into Smart City

The following table1 in which it was assumed a no.ofdevices,with a certain kwh

consumption,with a functioning assumed for a given no.of hours per day

Appliances	*Time slot [a,b]*	*N (number)*	*W (Kwh)*
Wash machine	14-20	2	0,8
Water heater 1	16-20	1	1,5
Microwave oven 1	5-9	1	1,2
Electric Kettle	14-17	1	1,8
Air conditioning	16-23	2	1,5
Water heater 2	5-10	1	1,5
Microwave oven 2	19-21	1	1,2
Refrigerator	0-24	1	0,5

Table 1: The data used in the case of family

The simulation for household results are summarized as follows in Table 2:

Appliances	*Xij*
Wash machine	16-17
Water heater 1	17-18
Microwave oven 1	8-9
Electric Kettle	15-16
Air conditioning	16-17 23-24
Water heater 2	05-06
Microwave oven 2	21-22

Table 2: A Planning result in case household

WHICH SMART GRID FOR SMART CITIES?

Smart grids are a key component of the strategies toward a sustainable energy future, as they not only can facilitate the integration of renewable energy sources and the electrification of transport, but also can enable new energy-related value-added services. In particular, the transformation of urban settings will be driven by the design and deployment of smart grids. Power grids already reach every corner of cities, and with the expansion of their capabilities with smartness and data flows, they will underpin future urban infrastructure and services not strictly related to their "internal operation."The extended reach of distribution grids, their character of indispensable basic service to other infrastructure, and their maturity in the integration of advanced technologies make them an exemplary guide for the implementation of the smart cities. In particular and in light of the transition to smart cities, distribution grids play a central role as enablers of economic value.The massive introduction of information and communication technologies, inside the utilities, in the interface with other market actors, and in the premises of the end users, has not just changed the way the electricity system is operated, but also facilitates new interactions among all stakeholders and provides new means for the creation of social welfare and economic values.

ASSESSING THE SOCIETAL IMPACTS OF SMART GRIDS IN LIGHT OF SMART CITIES

This vision will require the mobilization of significant investments, coherently articulated in time. We discuss how an extended CBA methodology can be the best instrument for the decision making and the governance of the transition toward smart cities.The need for and value of such an assessment reside in the fact that all social stakeholders might gain a better understanding of the relative pros and cons of the proposed intervention. The projects leading to a smart city will be so far-reaching that instruments such as social licenses might be advisable. Social license is defined as the explicit social acceptance by a community and suitable in this case as smart cities will be changing the social context

DISASTER MANAGEMENT

Sushmitha.M 172033 EEE-'B'

Every disaster teach us to be 'insure before occurring' .In this article we are discuss about disaster management and ongoing project in disaster management. disaster is a sudden and serious disruption occurring over a short or long period of time that causes life loss, material loss, economic drop down or environmental loss .Developing countries suffer the greatest costs when a disaster hits they suffers a lot to come back from the effects. Disaster are divided into two catagories 1.Natural Disaster and 2.Human Made Disaster

Natural disaster is a natural process or phenomenon like earthquakes, landslides, volcanic eruptions, floods, hurricanes, tornadoes, blizzards, tsunamis, and cyclones. Even in 2020 January Australia was ravaged by the worst wildfires seen in decades, 28 people died nationwide, and in the state of New South Wales (NSW) alone, more than 3,000 homes had been destroyed or damaged. Really it takes a long time for Australia to overcome from the effects. However Australia its wildlife and natures beauty.

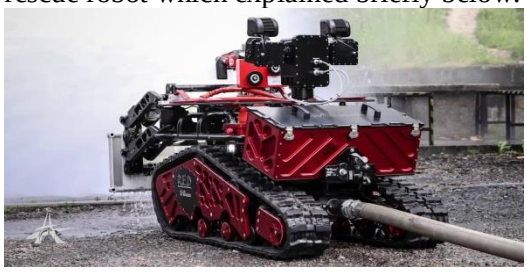
Human made disasters (Anthropogenic hazards) are hazards caused by human action or inaction like transport accidents, industrial accidents, oil spills, terrorist attacks, nuclear explosions/nuclear radiation War. In India 1984 December 3 Bhopal Gas Tragedy in MP (Madhya Pradesh) which is consider us one of the biggest human made disaster in Indian history. More than 3,787 victims killed in the gas leakage tragedy.

Disaster Management defined as the group or organization of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular, response and recovery in order to reduce the impact of disasters. On 1 June 2016, PranabMukherjee, the Ex-President of India, launched the Disaster Management Plan of India, which seeks to provide help and direction to government agencies for prevention, mitigation and management of disasters. This is the first plan nationally since the enactment of the Disaster Management Act of 2005.

- **PHASES:**
  1. Mitigation- Minimizing the effects of disaster.
  2. Preparedness- Planning how to respond.
  3. Response- Efforts to minimize the hazards created by a disaster.
  4. Recovery- Returning the community to normal.
- **GENERALOBJECTIVE:**

1. Ensure the safety of all employees and visitors at the site/facility
2. Protect vital information and records
3. Secure business sites and facilities
4. Safeguard and make available vital materials, supplies and equipment to ensure the safety and recovery of records from predictable disasters
5. Reduce the risk of disasters caused by human error, deliberate destruction, and building or equipment failures
6. Be better prepared to recover from a major natural catastrophe
7. Ensure the organization's ability to continue operating after a disaster
8. Recover lost or damaged records or information after a disaster

As an engineer I feel proud to say that now a days drones and robots with AI (Artificial Intelligence) are introduced in disaster management rescue system. They can save human life without stake another life. Rescue robots in development are being made with abilities such as searching, reconnaissance and, removing or shoring up rubble, delivery of supplies, medical treatment, and evacuation of casualties. There are three main levels of challenges. First, the information processing of the robot. Second, the mobility of the robot. Third, the manipulation of the robot. ICARUS ROBOT project is an unmanned rescue robot which explained briefly below.



ICARUS ROBOT:

The European Robotics project, ICARUS, aim is to develops an unmanned search and rescue technologies for detecting, locating and rescuing humans. The objective of the team of robots is primarily gathering data.

In major crisis, a primary task of fire and rescue services is the search for survivors at the site of the incident. This is a complex and dangerous task, which frequently, causes deaths among the managers of the humanitarian crisis. The introduction of unmanned rescue and search devices can speed up rescue and become a valuable tool to save human lives.

- **REFERENCE:**

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Robots: From Science Fiction to Technological Revolution


VISION
TO BECOME A HIGH STANDARD OF EXCELLENCE IN EDUCATION,
TRAINING AND RESEARCH IN THE FIELD OF
ELECTRICAL AND ELECTRONICS ENGINEERING
AND ALLIED APPLICATIONS


MISSION
TO PRODUCE EXCELLENT, INNOVATIVE AND NATIONALISTIC ENGINEERS
WITH ETHICALVALUES AND TO ADVANCE IN
THE FIELD OF ELECTRICAL AND ELECTRONICS ENGINEERING
AND ALLIED AREAS