Academic Year 2016-17

Annexure I

1. Project Title: Smart Power Supply with GSM Based Appliance Control

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1. Abstract & Objective

1.1 Abstract

Electricity has become an integral part of modern life and one cannot think of a world without it. At the same time, the demand for electricity is increasing every day; frequent power cuts are causing many problems. Especially at the time of blackouts, electric power distribution system is destroyed which in turn take weeks to restore the power supply. Hence an alternative arrangement for power source is a must.

We are proposing an idea about an easily maintainable power supply system along with appliance control using mobile phone. It will provide power supply using individual batteries without any interruptions to exigency areas like hospitals, hotels etc.

1.2 Motivation

In the present scenario, the need for electricity is increasing every day and frequent power cuts are causing many problems mostly in rural areas. A power out in the emergency situation of a hospital can succumb patients' life. Especially at the time of natural disasters, wide scale power failure may occur. Enormous infrastructures will be destroyed, including electric power distribution system and this causes severe blackouts and it may take weeks to restore the power supply.

Thus, In order to solve these sorts of problems, majorly at household and hospitals, continuous efforts are made to switch over to an alternate system that provides power supply without any interruptions.

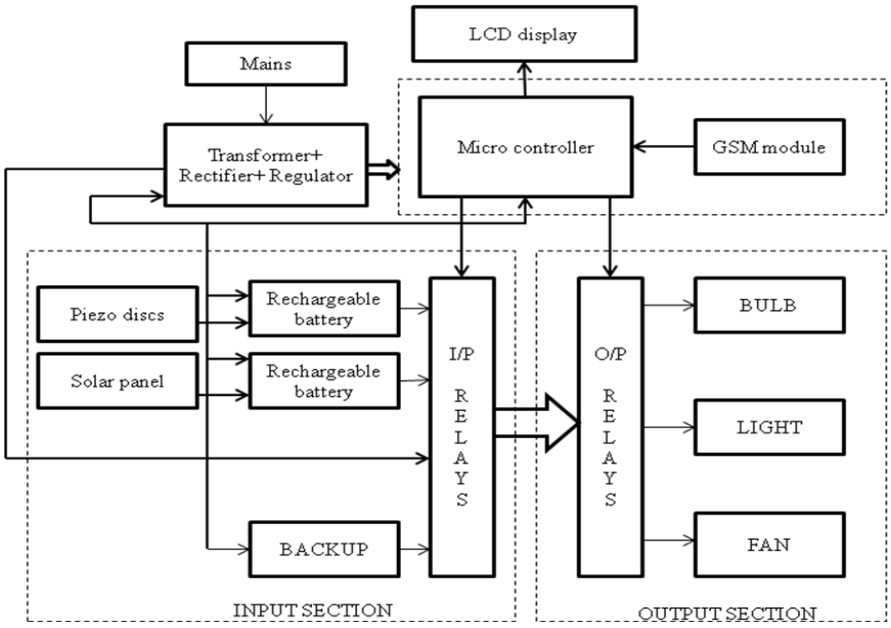
1.3 Objective

"Smart Power Supply with GSM based appliance Control", is an embedding of both the concepts of "Multi-Power Sources" and "Appliance Control". The goal of this project is to develop a low cost, low power and reliable system for providing an emergency power supply without interruptions and controlling the appliances from anywhere. It helps to reduce the power consumption by reducing dependency on the domestic power supply and by controlling the devices. With user friendly interfaces, this system allows its user to control the home appliances from anywhere by just sending a message. So the overall objective of the project is to reduce dependency on conventional resources for energy by utilizing natural resources and to provide a comfortable life.

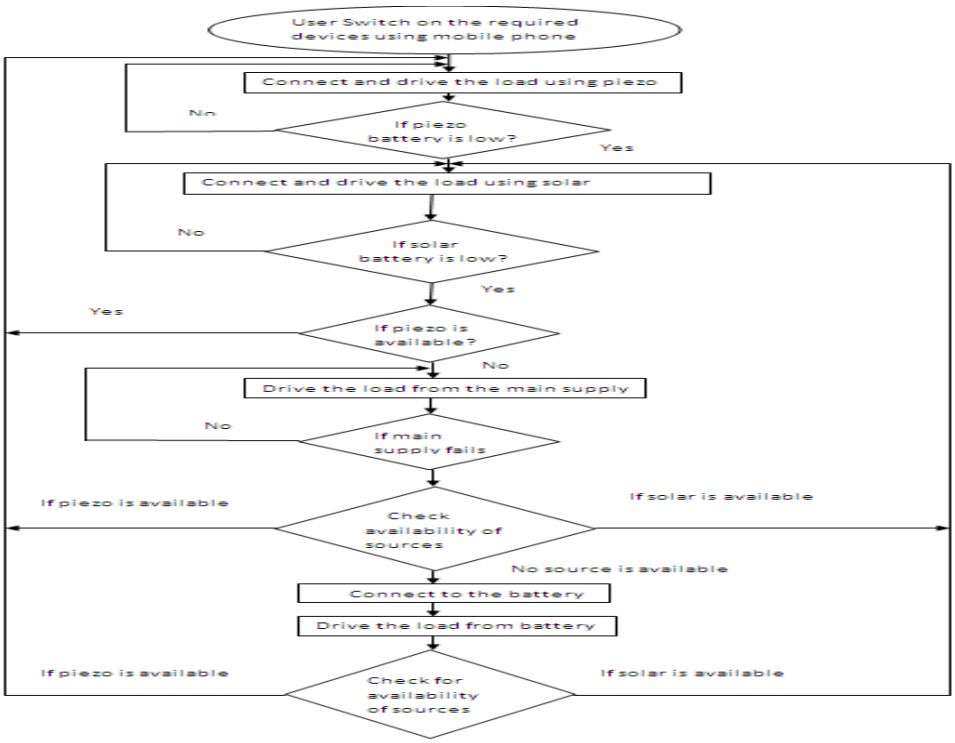
2. Block Diagram & Technical Specifications

2.1 Block Diagram and Working:

2.1.1. Block Diagram:



2.1.2. Flow Chart:



2.1.3. Working:

Input section

In the input section, initial input source is piezoelectric discs, which are connected in series for providing power supply. The battery will be recharged using this source. If any case of degradation of voltage level, microcontroller senses it and automatically switches into the next prioritized source, which is the solar power source and remaining all relays are opened.

Similarly if the solar power is less than certain limit (5V), then the output connections shifted towards mains power source. Meanwhile if any power source is available (piezo or solar), then connections are shifted towards them based on the priority. If no source is available, then all the connections are shifted to the backup supply. Meanwhile if any power source is available (piezo or solar or main), then connections are shifted towards them based on the priority.

Output section

In the output section, different loads are present. These loads are driven using the smart power supply by the usage of relays before each and every load. By sending a simple message in the predefined text format. The GSM receives the message from the mobile phone and the microcontroller control the output appliances by switching corresponding relays.

The appliances statuses are shown on the LCD Display. It shows whether the required device is ON or OFF. There is no interruption in the loads even the input sources are kept switching.

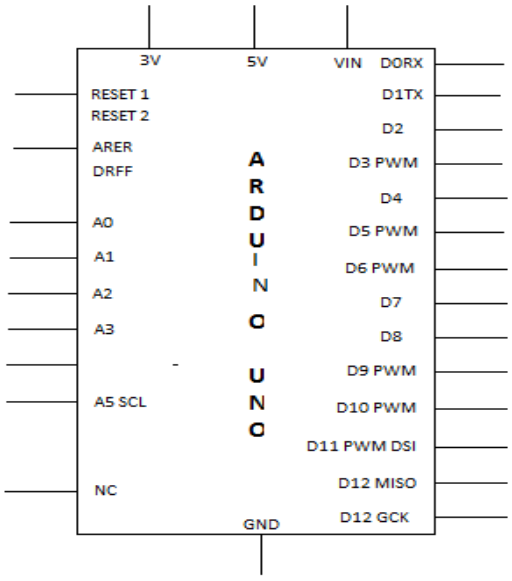
2.2 Technical Specifications:

2.2.1. Arduino Uno Board:

- The Arduino Uno is a microcontroller board based on the ATmega328.
- It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.
- An Arduino board historically consists of an Atmel 8, 16or 32bit AVR microcontroller
- For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on the Processing project, which includes support for the C and C++ programming languages.

Technical Specifications:

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm
Weight	25 g



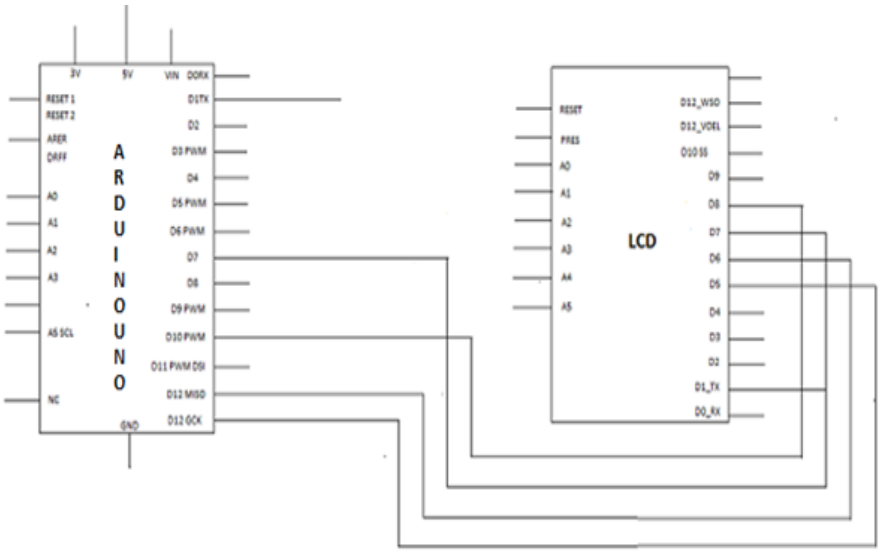
2.2.2. 16X2 LCD:

Features:

- ✓ LCDs are economical
- ✓ Easily programmable

- ✓ Supply voltage: 4.7V – 5.3V
- ✓ LCD has two registers, namely, Command and Data.

Arduino Uno Interfacing With 16x2 LCD:



2.2.3. Global System for Mobile Communication

GSM: SIM800L

GSM is a digital mobile telephony system. GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band.

Because radio spectrum is a limited resource shared by all users, a method must be devised to divide up the bandwidth among as many users as possible. Chose a combination of TDMA/FDMA as its method. The FDMA part involves the division by frequency of the total 25 MHz bandwidth into 124 carrier frequencies of 200 kHz bandwidth. One or more carrier frequencies are then assigned to each BS. Each of these carrier frequencies is then divided in time, using a TDMA scheme, into eight time slots.

Features:

- Input voltage : 5V to 12V DC

- Quad-band 850/900/1800/1900MHz
- Control via AT commands
- Low power consumption

2.2.4. ZX-18T9A1 18mm Piezo Transducer:

Material: Copper + ceramic.

Features: Resonant frequency: 8.0 +/- 0.7 kHz;

Resonant resistance: 350ohm (max);

Capacitance: 7000(PF) +/- 30%;

Input voltage: DC 30V;

Operating temperature: -20~+70'C;

Storage temperature: -30~80'C;

Brass disc: 18mm +/- 0.1mm;

Ceramic disc: 14mm +/- 0.1mm;

Lead length: 7cm

Application: For DIY project. Packing List:10 x Piezo transducer sound discs

2.2.5. Relay JQC-3F-(T73)-DC5V:

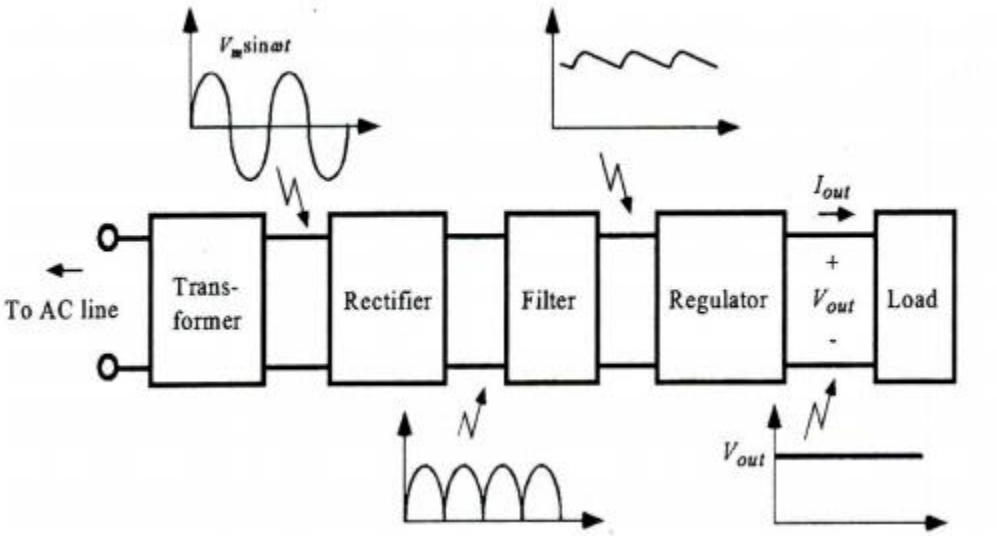
Features:

1. Coil Current: 30mA
2. Coil Voltage: 5VDC
3. Contact Form SPDT (1 Form C)
4. Contact Rating (Current): 7A
5. Switching Voltage: 250VAC, 100VDC

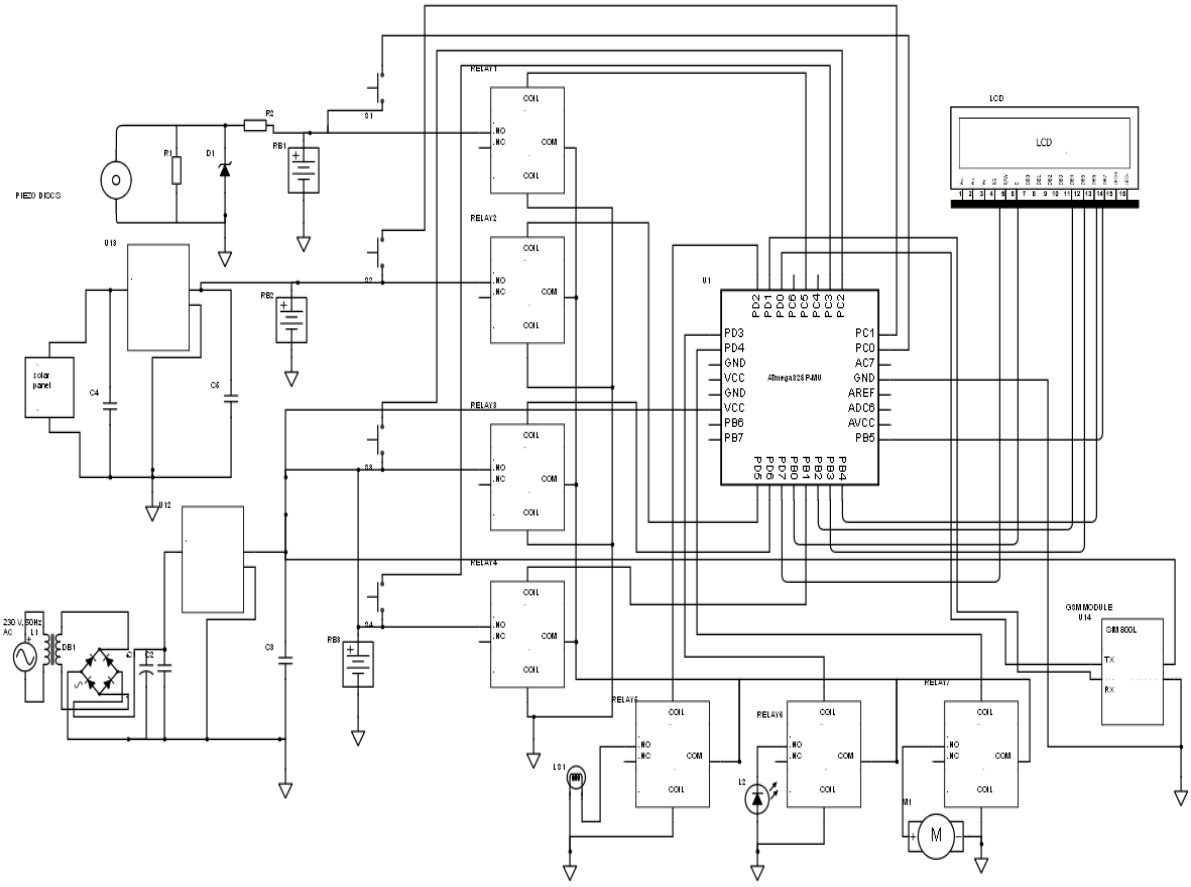
2.2.6. Regulated Power Supply

The power supply is designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is

known as ―Regulated D.C Power Supply‖ .For example a 5V regulated power supply system as shown below:

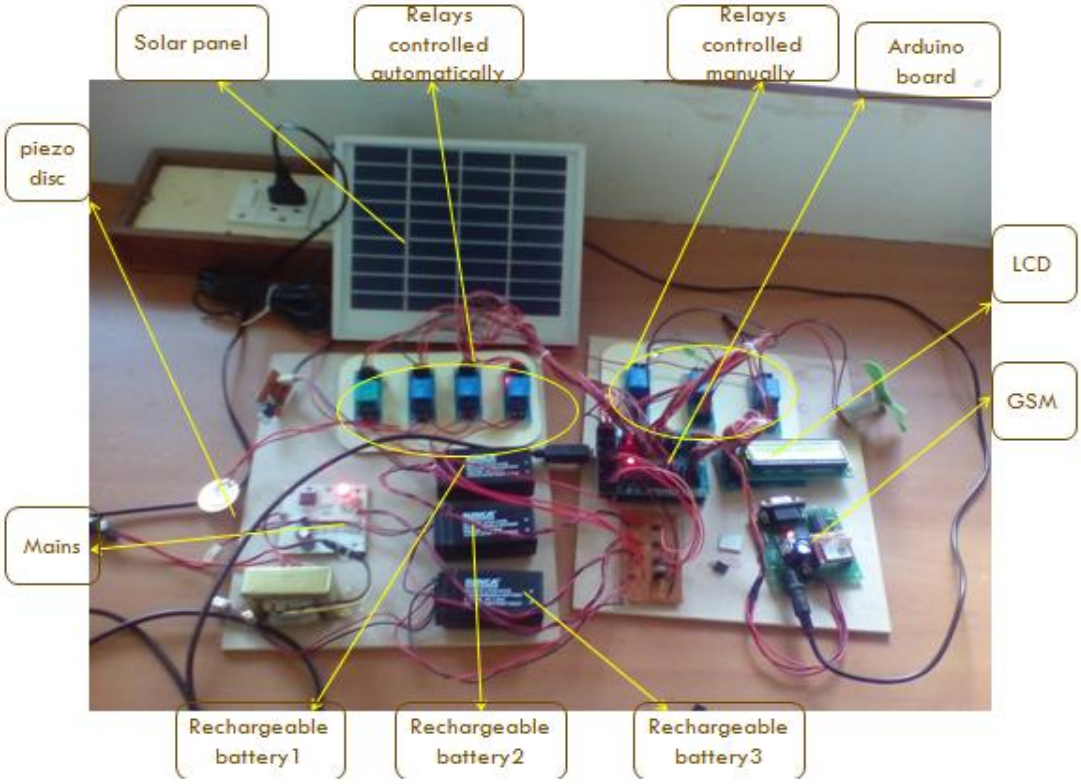


2.2.7. Overall Schematic:

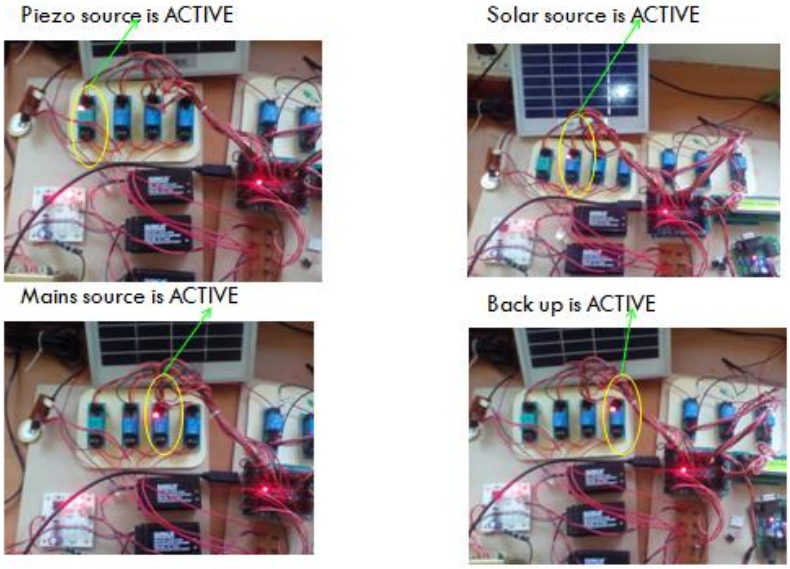


2.3. Results & Analysis

Below diagrams shows the circuit (hardware) setup of Smart Power Supply with GSM based Appliance Control. Programming is done using embedded c.



Following diagrams shows various alternative power supplies activated in different times.



3. Conclusion

3.0. Conclusion

Implementation of this project is designed to provide a smart power supply which can effectively decrease the electricity bills in two different ways, first one is by reducing the dependency on domestic power supply with the use of renewable resources and the second one is control of home appliances from anywhere with which the wastage can be reduced. The design model is easy to implement and very customizable according to the user requirement. The integration of GSM with smart power supply will provide us various open doors for energy saving techniques and smart controlling techniques.