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Case Study On Solar Reporter: A Remote Terminal Data Logging And Data Monitoring Unit For Solar PV Installations

| ALFATEK

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Motivation: Measure, monitor, data-log and transmit the current generation from solar PV panels and the current environment parameters like temperature, and humidity to remote central servers. The data is useful in keeping a record of the current generation and the environment conditions. Subsequent analysis of the data can also help in providing critical inputs for optimizing power generation at the solar PV farm.

For MW-scale utility projects, remote data monitoring systems are an essential feature of charge controllers and electronics supplied by Siemens and ABB. These are useful in monitoring the current generated in each 'strings' and detecting a faulty solar panel. For smaller projects of 100 KW and below, remote monitoring systems are not always supplied by the system vendors. The challenges of monitoring the strings and identifying the weakest panel remain unsolved, resulting in lower power generation. ***This creates the need for an autonomous remote monitoring unit to take over the challenges of maintenance of solar installations, and optimizing the power yield.***

Objective: Develop a robust SCADA solution that would be an unobtrusive and independent unit that can measure the environment variables using its sensors, record the data and transmit it through the GSM network to a remote server. The data would then be accessible to the end-user through the internet.

Deliverable: Solar Reporter – a remote terminal data logger unit that can measure, and data-log the temperature, humidity and generated current at the solar PV farm.

Hardware: The data logger was developed by integrating the following components:

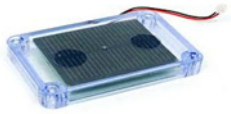
i. ***Micro-controller*** – The microcontroller and its motherboard is the brain of the data logger. It has to interface with the sensors and GSM modules to interpret the data from the sensors and send it to the GSM module for onward transmission.

ii. ***Temperature and Humidity Sensor*** – This can sense the ambient temperature and the humidity conditions and send the data to the microcontroller.

. Hall Sensor (Current Sensor)

SD Memory Card

GSM Module



0.5 W Solar Panel

Lithium Ion Battery

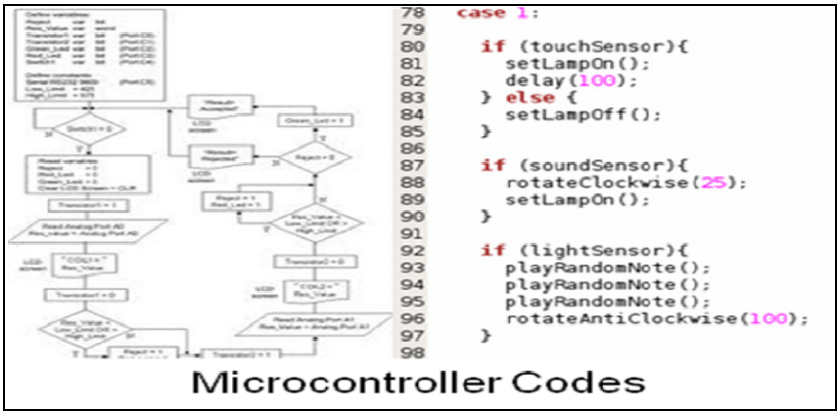
iii. ***Hall current sensor*** – This is a non-contacting current sensor that can measure the current generated by a solar PV panel. The data is then sent to the micro-controller.

iv. ***SD Memory card*** – The data collected by the sensors is stored in the SD memory card.

v. ***GSM module*** – The data collected during the day is sent to the remote server through the GSM module. This module can use the GPRS network to transmit the data.

vi. ***Solar panel and battery*** – The data-logger has its own independent power supply and battery. The battery is recharged by a solar panel during the day.

Software: The most critical and important part of the system integration is the micro-controller codes that runs the system. The codes need to be carefully written to ensure that the system remains stable and robust, consumes as little power as possible, and remains 'alive'. A well-written code can dramatically improve over-all system performance and power consumption.



```
78  case 1:
79
80    if (touchSensor){
81      setLampOn();
82      delay(100);
83    } else {
84      setLampOff();
85    }
86
87    if (soundSensor){
88      rotateClockwise(25);
89      setLampOn();
90    }
91
92    if (lightSensor){
93      playRandomNote();
94      playRandomNote();
95      playRandomNote();
96      rotateAntiClockwise(100);
97    }
98
```

Microcontroller Codes

Client: ***Arantec Enginheria SLP***, Pyrenees, Spain is a leading infrastructure company engaged in providing project management and technical consultancy services to its clients.