Artificial Smart Tree

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Abstract - Energy challenges will be met by innovative solution that enable a sustainable economy and reduce pollution as well, in addition to cost reduction. We propose a newly designed tree that converts daylight into electricity using solar modules connected as leaves on tree for electrolysis process of waste water into hydrogen and oxygen.Oxygen will be released to air and hydrogencan be used as fuel vehicle of the future. In addition to this LED lamps connected on leaves light up at night, thus acting as anAutomatic street light. This also reduces cost as compared to conventional street lights.Increase in atmospheric temperature would automatically stop hydrogen production to ensure safety. To overcome disadvantage of solar modules during monsoon, piezoelectric plates would be used to generate electricity from rain, snow or hail. A prominent feature is the inclusion of control room access via wireless technology, which would help in displaying emergency information like traffic updates. Revenue generation can also be achieved using the display board.

Keywords: Solar modules, Electrolysis, Automatic street lights, Circuit breaker, Zigbee controlled control room access.

I. INTRODUCTION

1.1.The Energy Scenario

The economic development of a country is often closely linked to its consumption of energy. Although India ranks sixth in the world as far as total energy consumption is concerned, it still needs much more energy to keep pace with its development objectives. India's projected economic growth rate is slated at 7.4per cent during the period 1997-2012. This would necessitate commensurate growth in the requirement of commercial energy, most of which is expected to be from fossil fuels and electricity. The scope of this project is vast as it can be applied in rural as well as urban areas. The prime objective of this project is to achieve electricity generation using solar energy and use the same for a variety of essential purposes, in an eco-friendly manner.

1.2. Existing Technology

The idea for Artificial Smart Tree was inspired by a revolutionary work, Solar Tree, currently being implemented in Vienna, Paris and Milan. It was created by Ross Lovegrove, and developed and produced by Artemide in collaboration with Sharp Solar, world leader in solar cells production. This revolutionary urban lighting project works with the most advanced solar technology respecting not only environmental issues but also cultural and social aspects of today's world. Solar Tree demanded very complex studies and analyses which Artemide has conducted with great commitment and sensitivity regarding ecological demands.

II. OBJECTIVES

We propose a project that uses all the aspects earlier provided by the solar tree in addition to some more aspects added by us. This the objectives include:

- Air purification
- Hydrogen production
- Circuit breaker
- Control room access
- Wireless advertisement and emergency information display board
- Revenue generation
- Versatile charger
- Automatic street lighting

III. DESIGN

3.1. Block diagram

As shown in figure, solar panel is used to convert light energy into electricity which is then applied to a battery to store it. With the help of battery and microcontroller we do the electrolysis of water which helps to produce hydrogen and oxygen.

Relay is an electrically operated switch which is used as a circuit breaker. It is used to operate the sensors used in the circuit i.e. temperature sensor and light sensor.Temperature sensor is used to measure the temperature. Zigbee module is used to transfer data over long distance. LCD display is

used to display the data.

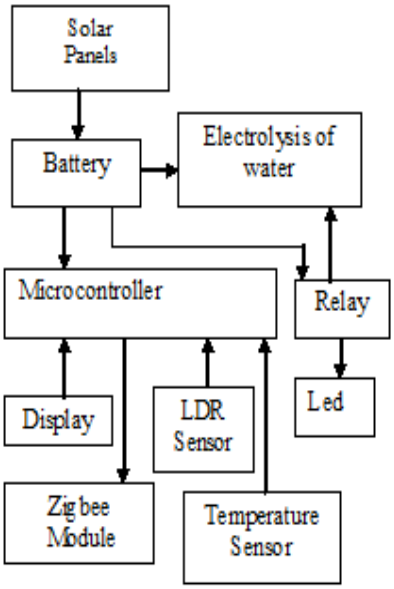


Figure: Block Diagram

The Artificial Smart Tree uses solar modules, battery, a PIC16F877A microcontroller for achieving the various objectives listed earlier and relay as a circuit breaker.

It uses a Light Dependent Resistor (LDR) as a light sensor for Automatic street lighting, LED lamps as street light, a thermistor as a temperature sensor for cutting off hydrogen production when required. It uses a zigbee module transmitter at control room site and a receiver at tree site to transmit and receive emergency information, advertisements, etc. The information received is displayed using a 20x4 LCD screen.

3.2. Electrolysis

Water electrolysis to produce hydrogen and oxygen is an old technology originating in the early19th century shortly after Volta introduced the first battery in 1800. The principle chemical equations are shown, where the electrochemical flow is shown for acidic and alkaline environments. This work involves the alkaline reaction pathway.

Acidic Reaction:

H_2O --> ½O_2+ 2H+ 2e-

2H+ + 2e- --> H_2

Alkaline Electrolysis:

2OH- --> ½O_2 + H_2O + 2e

$2H_2O$ + 2e- --> H_2 + 2OH-

Net Reaction:

H_2O -->H_2+ ½ O_2

3.3 Microcontroller

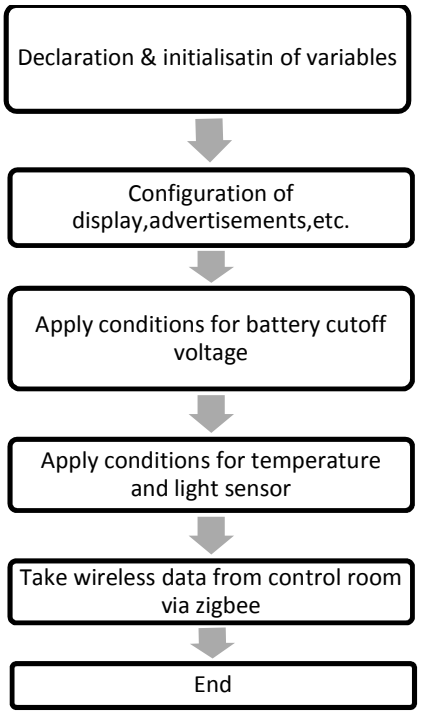
The microcontroller used, i.e. PIC16, is a crucial part of this project. It is used over an 8051 microcontroller because of its inbuilt ADC. The software to be used for development of this project is PIC Simulator IDE.

IV. IMPLEMENTATION

4.1. Relay inputs

High cutoff for battery	13.5V
Low cutoff for battery	10V
Circuit breaker cutoff for temperature sensor	313 K
Circuit breaker cutoff for light sensor	100 lux

4.2. Software Simulation



V. RESULTS

The Artificial Smart Tree consists mainly of two basic sections or attributes: the first is the proper implantation of solar panels to produce power and store it in a battery, and the second is to utilize this energy to drive the various aspects mentioned in the project. Both these sections are working properly.

REFERENCES

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