Solar Operated Purified Water ATM Using RFID Based For Rural Areas

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Abstract- **Now a day's water vending machines are available and operated only on coin but our aim is to design water vending machine which is operated on RFID thus it's straightforward for any manifest user to access the vending machine without cash. The designed system basically has RFID as input and purified water through solenoid valve as output. What makes this project unique is it is solar operated which will be more helpful in rural area as there is problem of electricity. The main part is control system which includes C programming in Arduino ATMEGA 328 microcontroller to control various components in system. The major advantage here is there is no need for any mandatory person to take care about the system. This project makes things easier, simple and time efficient at low power consumption.**

Index terms- **RFID, LCD display, ATMEGA 328 Microcontroller Vending machine, Relay**

1. INTRODUCTION

Water has become the most commercial products of century. The rapidly rising population and changing lifestyles has increased the need for fresh water. Water ATM is most popular product that is use to serve public. With innovations in this field we can touch the areas of rural also to prevent the health issues arise by impure water. As we know the function of vending machines, with the same technology used we are going to design a project which is based on RFID operation.

This product is not so new but technology which we are using is completely new we are using RFID cards. This system is based on microcontroller. Our aim is to stop wasting of water and preventing the use of plastic. Also we are providing the RO treat water in rural areas, this will make them hygiene. The inputs to the microcontroller will be given by RFID tag and output in the form water. This project is divided into two major parts; hardware and software. Hardware part includes the electronic circuit the software parts includes the programs written in the embedded C. Looking at the specifications required for Water Dispensing System and for simplicity of our application, microcontroller was found to be best suited. If the ID is registered and the card is recharged then a signal is given to the microcontroller and accordingly water pump gets activated and water will be dispensed. Driver Circuit consists relay, which acts as a switch to turn ON and OFF. The main motto of this system is to avoid the environmental pollution and also to avoid the wastage of water with the help of water control valve. We know that the available water resources have initiated towards the end.

As it is RFID operated machine, the required quantity of water and respective amount of money is decided that are affordable for common people. We have decided to use the Water cooler for our project demo. The cooler is run on 230V AC and so we are using solar energy to run it. Also Arduino is use to get the RFID data and if the ID is registered then only the water will provide like Aadhaar Linking Vending Machines.

2. OBJECTIVES

On the basis of our survey it is found that the present coin operated water vending machines are huge and occupy more space and cannot be utilized in all the required places. Hence, we choose our project and its title as 'RFID Operated Portable Water Vending Machine'.

Project Objectives

1 To provide purified drinking water.
2 To design and fabricate a portable machine using solar and RFID.
3 To adopt simple design mechanism that can be easily maintained.
4 To make use of existing pre-purified water bottles (20lts can) as refills for vending machine.
5 To extend drinking water facility for common public.

3. LITRATURE REVIEW

The thought has been developed from the first century engineer. The most objective at that point was to dispense mounted quantity of water then continuing its modification journey principally commercially.

The vending machine to be successfully commercialized by Thomas Adams was used for sale of their chewing gum in underground stations of New York. In 1902 the first company of vending machines emerged, Horn and Hardart company in Philadelphia. In the nineteenth century, the first vending machine to be successfully commercialized by Thomas Adams was used for the sale of their chewing gum in underground stations of New York. Only in 1902 the first company of vending machines emerged, Horn & Hardart Baking Company in Philadelphia. In turn, the Committee Definitions of the American Marketing Association define vending machines as "retail sales of products or services by operating machines that are used by end consumers" (STEIN, 1964). Market developed via automatic vending machines has grown quickly since it is convenient, faster and cheaper (KIM, YOO, 2012). The vending machine also had an important role in the new economy of America, being a generator of Employment (WEEK, 1999; Apud LEE, 2003). Yet there is some vulnerability in this kind of business. When the economy is in recession, sales of this business also decreased (LEE, 2003). For example, the consumption of products from vending machines decreased by 5% in 2001 due to the economic downturn (National Automatic Merchandising Association, 2002; Apud LEE, 2003).

Nowadays, vending services include a large number of products such as coffee, drinks, snacks, books, toys and other products located in stations, schools, universities, companies and hospitals (KIM, YOO 2012). However, STEIN (1964) pointed out a limitation, clearly stating that is not possible to serve a "full meal" in a vending machine. Regarding the evolution of the vending machine itself, in the '30s, there was the coin changers' development. Also in the '30s, small refrigerator was placed inside the vending machine, which allowed the sale of chilled drinks and ice cream at competitive prices compared to sales in stores. In turn, in the 50s, the automatic coffee machines expanded to several small businesses. Its clean look and beautiful design would be appropriate in railway stations, villages or classrooms. In the '60s, two manufacturers have introduced machines with the hypothesis of automatic note changers (STEIN, 1964). In 1961, a million and a half of the U.S. population bought at least one product in the vending machines every day (STEWART, 1961; Apud STEIN, 1964). Vending machines were developed further, which led to a focus on installation, training and / or existence of effective instruction, maintenance and repair, being essential to achieve customer needs and satisfaction in different markets. In turn, the development of new machinery found a wide range of design requirements in project stage (GOFFIN, 2000).
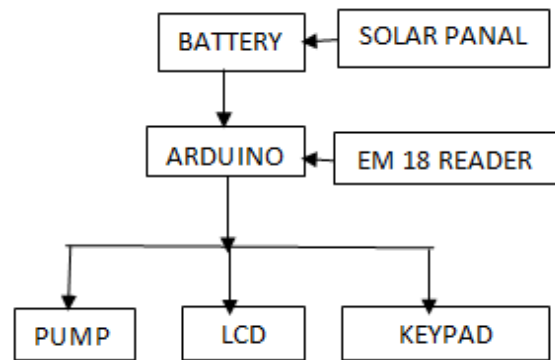
4. SYSTEM ARCHITECTURE

Fig.1 Block Diagram of system

The block diagram of the system has been shown in figure 4.1. It consists of

A. ARDUINO:

Arduino is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs),6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button.

Fig.2 Arduino Board

It comes with the operating voltage 5V, however, the in[ut voltage can vary from 7 to 12V. Arduino Nano circuit board with Arduino IDE is capable of reading analog or digital input signals from different sensors, RFID reader module, activating the motor, turning LED on/off and do many other such activities. In this system arduino acts as brain which controls all operations. Arduino gets iinput from RFID reader and user. There is one limitation using Arduino Nano i.e. it doesn't come with DC power jack, means you cannot supply external power source through a battery.

B. EM-18 READER MODULE:

RFID is an abbreviation for "Radio-Frequency Identification" and refers to a technology whereby digital data encoded in RFID tags are captured or identified by a reader via radio waves. One of the most common RFID EM-18 is used with microcontrollers RFID reader. Through RFID reader arduino gets input to identify user.

Fig.3 EM -18 Reader Module

C. LIQUID CRYSTAL DISPLAY:

An LCD (Liquid Crystal Display) screen is an electronic display module and has a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data.

Features of 16×2 LCD module

• Operating Voltage is 4.7V to 5.3V
• Current consumption is 1mA without backlight
• Alphanumeric LCD display module, meaning can display alphabets and numbers
• Consists of two rows and each row can print 16 characters.
• Each character is built by a 5×8 pixel box
• Can work on both 8-bit and 4-bit mode
• It can also display any custom generated characters
• Available in Green and Blue Backlight

The LCD is a dot matrix liquid crystal display that displays alphanumeric characters and symbols. 16x2 LCD digital display has been used in the system to show balance and recharge option to the user.
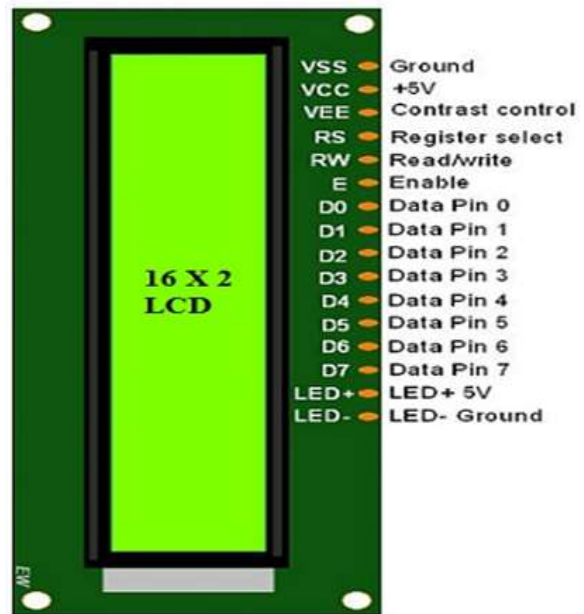

Fig.4 Liquid Crystal Display

D.   DC PUMP

This is Micro Submersible Water Pump DC 3V-5V, can be easily integrate to your water system project. The water pump works using water suction method which drains the water through its inlet and released it through the outlet.   You can use the water pump as exhaust system for your aqurium and controlled water flow fountain.

Specification:

- Input Voltage: DC 3V-5V
- Flow Rate: 1.2-1.6 L/min
- Operation Temperature: 80 Deg.C
- Operating Current: 0.1-0.2A
- Suction Distance: 0.8 meter (Max)
- Outside diameter of water outlet: 7.5mm
- Inside diameter of water outlet: 5.0 mm
- Diameter of water Inlet : 5.0 mm
- Wire Length: 200 mm
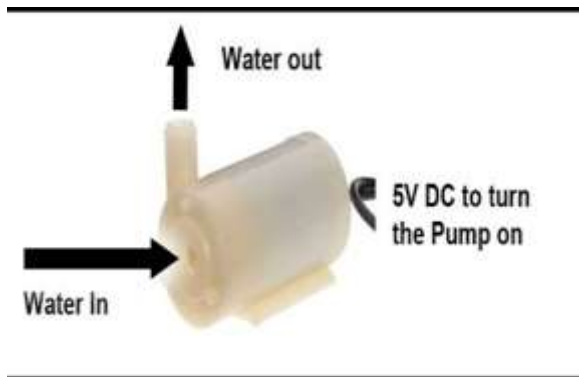- Size: 45 x 30 x 25 mm
- Weight: 30g

Fig.5 DC Pump

E.   SOLAR PANEL

Photovoltaic systems convert sunlight directly into electricity. Solar cells are made of semiconductors, such as silicon, which absorb the sunlight and convert it into electricity. Solar cells are connected electrically and packed together in a frame, commonly known as a solar panel. This 150 watt solar panel includes mono crystalline solar cells. The solar panel is very powerful and is very suitable for charging batteries and solar generations on the boat, gazebos or camping.
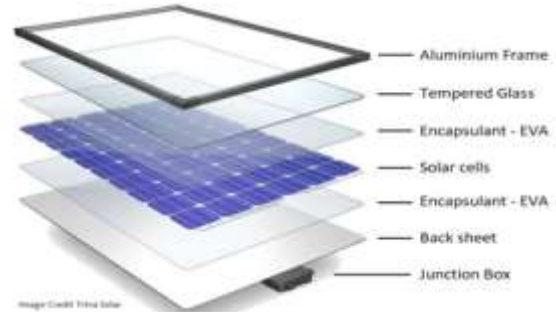

Fig.6 Solar Panal

5. ATM MACHINE PROTOTYPE

In the prototype of ATM machine based on arduino with microcontroller ATmega 328 using arduino sketch for compilation and programming to to design the code. This ATM machine used to provide pure water but this operation happened after the user has swiped the RFID card. If the card details matched i.e. user is authorized person then water will come out through tap and if card has not enough balance it will show option for rechargr the card.
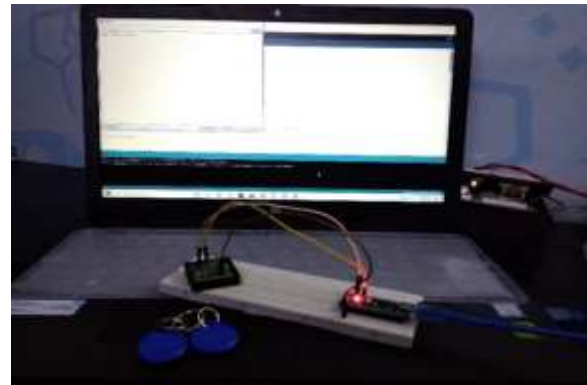

Fig.7 RFID Identification

In Fig.7 shows the RFID card read by RFID reader and serial communication to show the RFID identification.
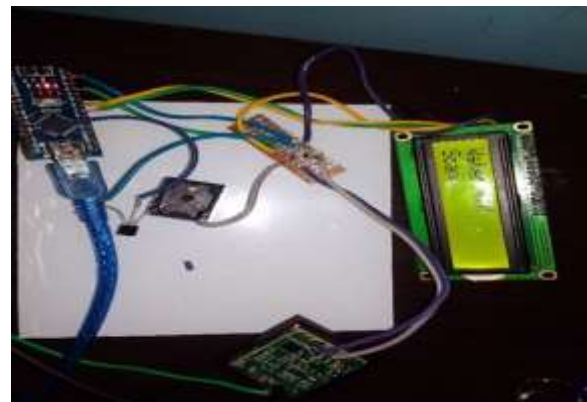

Fig.8 LCD interface with scan option

In Fig.8 shows LCD after user shows RFID card.

Fig.9 Prototype of ATM Machine

In Fig.9 shows whole sprototype of ATM machine.

6. CONCLUSION

In th recent time use of digital is increasing day by day with their accuracy and feasibleness. This system is time saving, portable and affordable. It does not required power as it gets power through solar energy. These water ATMs facilitate the humans with pure drinking water which will reduce the health issues. It is easy for everyone to use it any time. The RFID cards used will help user to access it. Machine is automatic so that it is running properly in rural areas. According to authorized person ATM machine provide particular amount of water. This system is more feasible to save precious time of human life. Useful to the time saving of our ATM machine folks will use this device in busy space like airport, colleges and workplace etc.

7. FUTURE SCOPE

This system is meant to provide high accuracy and price effectiveness. Various Indian as well as multinational companies such as Sarvajal, DJB-Tata Power, Amrutdhara Water Services Pvt. Ltd etc. are involved in this business. They are currently provide water provide drinking water to people in the range of 15 paisa to 1 rupee per liter on a pilot basis. We will install more sensor such as humidity, temperature, dust and smell.

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