SOLAR-COIN BASED MILK DISPENSING SYSTEM FOR SMART CITIES

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Abstract : With the advancement of technology, the 'Coin Operated Milk Dispenser' provides comfort and it fits well for its users in the era of modernization. Regulated power supply is designed to provide system with constant supply of 5 volts. The dispenser will dispense Milk only when the correct coin is inserted as well as with the placement of glass below the nozzle. The correctness of coin is detected by the coin sensor. If the condition is satisfied then a signal is given to the microcontroller and accordingly Milk pump gets activated and Milk will be dispensed. Here we put forward a fully automated coin-based Milk dispenser system using microcontroller and sensor. The system is capable of fully automated Milk/cola dispensing using motors and sensors. The system have a coin detector that is used to sense particular coins and send information to microcontroller about valid coins. On detecting a valid coin the system now sends a signal to the controller and then it starts the motor to pour Milk in glass using motor as long the glass is present. Thus, we here put forward a smart Milk dispenser system with Milk saving feature. When valid coin inserted, immediately 50ml Milk be dispensed. At the same time, it will display the Milk quantity levels.

I. INTRODUCTION

Each day, our lives become more dependent on 'embedded systems', digital information technology that is embedded in our environment. More than 98% of processors applied today are in embedded systems, and are no longer visible to the customer as 'computers' in the ordinary sense. An Embedded System is a special purpose system in which the computer is completely encapsulated by or dedicated to the device or system it controls. Unlike a general-purpose computer, such as a personal computer, an embedded system performs one or a few pre-defined tasks, usually with very specific requirements. Since the system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product. Embedded systems are often mass-produced, benefiting from economies of scale. The increasing use of PC hardware is one of the most important developments in high-end embedded systems in recent years. Hardware costs of high-end systems have dropped dramatically as a result of this trend, making feasible some projects which previously would not have been done because of the high cost of non-PC based embedded hardware. But software choices for the embedded PC platform are not nearly as attractive as the hardware. Typically, an embedded system is housed on a single microprocessor board with the programs stored in ROM. Virtually all appliances that have a digital interface watches, microwaves, VCRs, cars -- utilize embedded systems. Some embedded systems include an operating system, but many are so specialized that the entire logic can be implemented as a single program. Physically, Embedded Systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants.

In terms of complexity embedded systems can range from very simple with a single microcontroller chip, to very complex with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

II. LITERATURE REVIEW

milk dispensing systems have gained attention in recent years due to their potential to automate milk distribution processes. This literature review aims to provide an overview of existing research and developments in this area.

➢ Technological Components.

➢ User Interface and Experience.

➢ Operational Efficiency and Reliability.

➢ Economic and Environmental Implications.

III. PROPOSED METHODOLOGY

Designing a proposed system for a solar and coin-based Milk dispenser involves considering various factors such as the target market, technical specifications, user interface, and sustainability features. Here's a conceptual outline for such a system.

➢ Solar Power Integration

➢ Coin-Based Payment Mechanism

➢ Milk Dispensing System

➢ Community Engagement and Feedback

3.1.1 Solar Power Integration:

Utilize solar panels to generate electricity for powering the milk dispenser.

Install the solar panels on the top of the dispenser unit for maximum exposure to sunlight.

Include a battery storage system to store excess solar energy for use during low-light conditions or at night.

3.1.2 Coin-Based Payment Mechanism:

Integrate a coin acceptor mechanism that accepts common denominations of coins.

Design the interface to display the cost per volume of milk dispensed and the accepted coin types.

Ensure robust security features to prevent tampering or theft of coins.

3.1.3 Milk Dispensing System:

Implement a hygienic and efficient milk dispensing mechanism that can handle various container sizes.

Include sensors to detect the presence of a container and dispense the appropriate volume of milk.

Incorporate a system for sanitizing the dispensing nozzle between each use to maintain cleanliness.

3.1.4 Smart Monitoring and Control:

Integrate IoT (Internet of Things) technology for remote monitoring and management of the dispenser.

Enable real-time monitoring of milk levels, revenue generated, and operational status.

Include features for automatic alerts and notifications in case of low milk levels or technical issues.

3.1.5 Quality Assurance:

Implement strict quality control measures to ensure the freshness and safety of the dispensed milk.

Regularly test and maintain the dispenser to uphold hygiene standards and compliance with food safety regulations.

Include features for automatic shutdown in case of abnormal conditions or malfunctions to prevent the dispensing of spoiled milk.

IV. EXISTING METHODOLOGY

- "Design and Fabrication of Mutli Drink Vending Machine, Year 2002
Ch Ravi, P Sai Kiran, V Ganesh Kumar, G Ajay, V Raghu Vamsi, O Bhagavan.
The design and construction of a multi-drink vending machine is the primary goal of this little project. This machine's function is to offer people a wide variety of goods, including water, drinks, coffee, tea, etc. A machine that can sell things is a vending machine. Different products are being produced in what is more akin to an automated process without the need for man handling that we typically see in busy cities. These systems are now accessible in some of the best-rated restaurants and hotels in India as well as MNCs. In most systems the operation are carried manually by the operator in which the billing and change making is

carried out by the\sowner who running the shop or restaurant. There are strict requirements for interactive gadgets used in public settings, including user-friendly interfaces. This model's vending machine is made using plywood, fevicol gum, a DC motor, and other materials. batteries, etc."

- "RFID technology: Beyond cash-based methods in vending machine

Aneeqa Ramzan, Saad Rehman, Aqib Perwaiz

2017 2nd International Conference on Control and Robotics Engineering (ICCRE), 189-193, 2017

This paper characterizes the design, implementation and employment of cashless and secure payment system in vending machine by using radio frequency identification technology, to improve the traditional cash-based payment system that involved lot of problems and risks i.e., hacking, auditing, storing, currency and material of coins and notes. RFID is achieving momentum in a multiple sectors like retail, security, transportation, pharmaceuticals, defense, healthcare etc., and a host of other fields, and now vending machines. Our proposed methodology consists of passive RFID identification cards and reader for consumers, Arduino Mega microcontroller, SPI protocol for RFID and Arduino interfacing, keypad for password protection, liquid crystal display (LCD) for displaying consumer name and current balance, and SMS is sent for notification using GSM module. Spiral coil architecture is supported by DC motors powered by relays in mechanical structure of vending machine. It also describes how such product-oriented RFID card based vending machine can maximum facilitates the system engineering."

- "Milk dispensing machines in Kenya's dairy industry: trends and scenario analysis

Oscar Ingasia Ayuya, Dave Mwangi Ireri, Judy Kithinji, Asaah Ndambi, Catherine Kilelu, Bockline Omedo Bebe, Paul Ndung'u, Jan van Der Lee

Wageningen Livestock Research, 2020

This study analyses trends in the development of ATM milk retailing in Kenya ,based on data collected in six counties with high ATM density. Trends include growth in the ATM businesses and related support services, consumer perceptions and demand and milk quality and safety issues in this milk market segment. Building on the trends analysis, the second part of the study explores scenarios that are likely to affect further growth of milk ATMs. The evidence is intended to inform the necessary policy and regulatory framework that can support quality-driven investments in this growing retail market segment."

- "Automated milk quantity and quality checking and vending machine

S Suthagar, KS Tamilselvan, G Mageshkumar, S Muthupandian, VM Vinod

Int. J. Recent Technol. Eng 8, 4369-72, 2019

In this paper, each farmer is provided with a separate RFID tag, which has a unique code. When the RFID tag is punched against RFID card reader LCDs the code. Milk is deposited in the tank where its quality and quantity is determined. The quality of milk is examined using a pH sensor and its quantity is determined using an ultrasonic sensor. The milk is segregated into third categories depending on its quality as first quality, second quality, and rejection. Here three solenoid valves are used for segregation purposes. The milk is deposited in separate tanks according to its quality. The details such as cost, quality, and quantity of milk are fed to PC. The customer deposits the currency note. The web camera is used to capture the image of the currency note and it is compared with the database stored in PC. Here a switch is used for quality selection based on customer preference. Milk is vended based on the rupee note deposited and on the quality selected by the customer. The entire system is maintained with a refrigeration temperature of 4 C."

V. WORKING PRINCIPLE

In today's era of technological advancement, the Coin Operated Milk Dispenser stands out as a symbol of convenience and adaptability to modern lifestyles. This innovative system is designed with a regulated power supply ensuring a constant 5 volts, ensuring smooth operation. The dispenser revolutionizes the way milk is accessed, ensuring that it is dispensed only when the correct coin is inserted and a glass is placed below the nozzle.

The functionality of the dispenser is made possible through a sophisticated system of sensors and a microcontroller. A coin sensor is integrated into the system to detect the correctness of the coin inserted. Upon satisfying this condition and confirming the presence of a glass, the coin sensor signals the microcontroller. In response, the microcontroller activates the milk pump, initiating the smooth dispensing of milk into the waiting glass.

One of the standout features of this automated system is its ability to conserve milk efficiently. When a valid coin is inserted, the system is programmed to dispense a

specific quantity, such as 50ml, of milk. This not only ensures fairness in transactions but also helps in optimizing milk usage. Additionally, the system displays real-time milk quantity levels, providing users with important information at a glance.

Overall, the fully automated coin-based Milk Dispenser represents a significant leap in convenience and efficiency, offering users a seamless experience in accessing milk while promoting resource conservation and smart technology integration.

## VI. WORKING FLOW
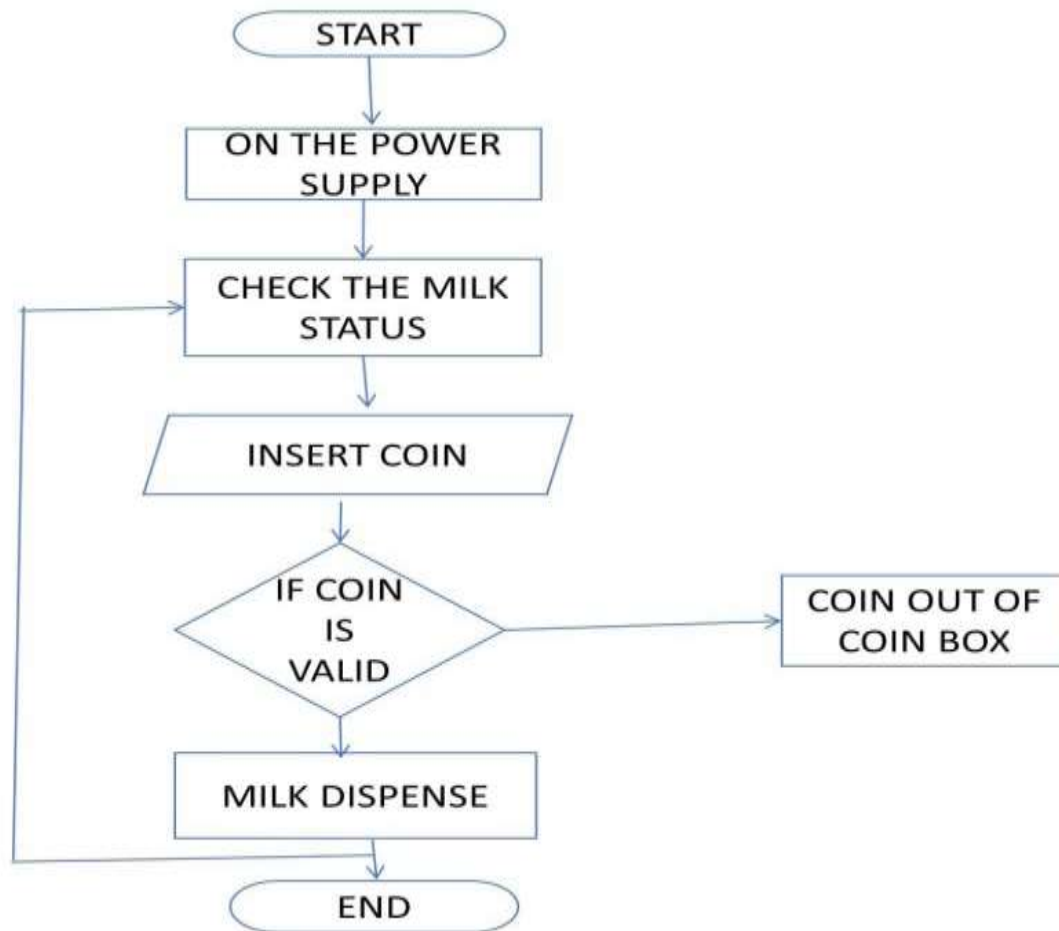
VII. ARDUINO BOARD

Arduino is an open source microcontroller which can be easily programmed, erased and reprogrammed at any instant of time. Introduced in 2005 the Arduino platform was designed to provide an inexpensive and easy way for hobbyists, students and professionals to create devices that interact with their environment using sensors and actuators. Based on simple microcontroller boards, it is an open source computing platform that is used for constructing and programming electronic devices. It is also capable of acting as a mini computer just like other microcontrollers by taking inputs and controlling the outputs for a variety of electronics devices. It is also capable of receiving and sending information over the internet with the help of various Arduino shields, which are discussed in this paper. Arduino uses a hardware known as the Arduino development board and software for developing the code known as the Arduino IDE (Integrated Development Environment). Built up with the 8-bit Atmel AVR microcontroller's that are manufactured by Atmel or a 32-bit Atmel ARM, these microcontrollers can be programmed easily using the C or C++ language in the Arduino IDE. Unlike the other microcontroller boards in India, the Arduino boards entered the electronic market only a couple of years ago, and were restricted to small scale projects only. People associated with electronics are now gradually coming up and accepting the role of Arduino for their own projects. This development board can also be used to burn (upload) a new code to the board by simply using a USB cable to upload. The Arduino IDE provides a simplified integrated platform which can run on regular personal computers and allows users to write programs for Arduino using C or C++.

With so many Arduino boards available in the market, selecting a particular development board needs a variety of survey done with respect to their specifications and capabilities, which can be used for the project execution according to its specified applications.

Fig 1 Arduino UNO Board

VIII. BLOCK DIAGRAM
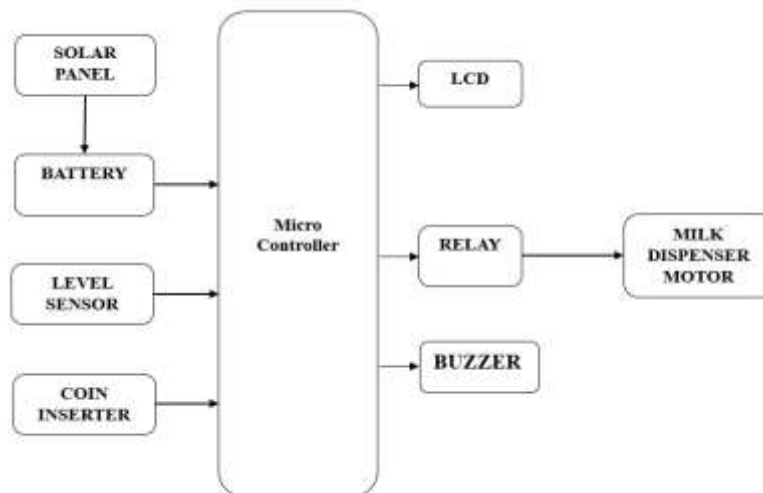
IX. RESULTS AND DISCUSSION

Fig 2 Project Kit (solar-coin Based Milk Dispensing system)

Fig 3 LCD output before inserting a coin

Fig 4 LCD output After inserting a coin

Fig 5 Dispensing kit output before inserting a coin

Fig 6 Dispensing kit output After inserting a coin

DISCUSSION:

- This Project work introduces a Milk dispensing machine which operates on coin and it is a solar powered.

- Various devices like a regulated power supply, coin sensor Milk pump, solar panels etc., are embodied to design an efficient dispensing system.

- The system can be programed for one rupee coin and for certain duration with the help of algorithm and programming in Arduino.

- The dispenser can be installed on roads (highways), railway stations and other public places to provide water to people at low cost.

- The outcome of this project is Solar powered coin based Milk dispenser system in which power is supply by both solar panels and by main source depend on climate.

- This product is design to overcome the problem of unhygienic practices and also reduces the load on electric power plant. And the solar power is also eco-friendly

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X. CONCLUSION

The coin based PDA charger is significant to open for using coin to charge for the mobile phone in any open places basically like charging it customarily. The endeavor work "Coin Operated Mobile Charger using sun fueled board " is organized, developed basically and the proto sort module is created with microcontroller for live show. An a little bit at a time approach is executed in this endeavor work and results are viewed as worthy. The critical endeavor is setting up the item for playing out the exercises depending upon the wellsprings of information. The show of the machine basically depends upon the item code we portray in the controller. The advancement utilized here is for working up the model module just; it must be changed in accordance with structure it into an authentic working system. Nearly 70% people use mobile phone all over world. This is useful in today's scenario. Because now-a-day's communication has become a major part in human lives. At many times we cannot carry mobile charger with us; if mobile discharges and we have any important work and charging sources are unavailable then this project is useful. Mostly in rural areas this system is useful because they always have the problem of lack of electricity.

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