AUTOMATIC WATER DISPENSER SYSTEM USING IOT

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ABSTRACT : **Coin-operated water dispensing machines are becoming more and more common because of how convenient and simple they are to operate. One of the major problems faced by most of the large institutions is maintaining drinking water in water dispensers at various places inside the institution. Monitoring a large number of water dispensers in huge buildings require a considerable amount of manual supervision. This paper proposes a prototype system design, implementation and description of required tools and technologies to develop Internet of Things (IoT) based water level monitoring system which can be implemented in offices, colleges or buildings where many number of water dispensers are present. The smart water dispenser sends a notification when the level of water becomes low in the dispenser through an application to the authorized person.**

Keywords **:** Arduino Uno, LCD, Buzzer, Wifi Module, Ir Sensor, Relay, Floating Sensor

INTRODUCTION

Water has become the most important product of human life. There is many stresses on multiple water resources. And on the other hand the rapid increase of population and changing lifestyles has increased the need for fresh water. As we see in present scenario it would clear that in most of the areas like households, public areas like railways station, bus stop, malls etc. are paying far more for more water supply than earlier. Also if this cost of fetching water which is almost equivalent. In summer, we face the problem of drinking water. So is the panic over drinking water supply in the city as well as in villages. The reservoir has just 35.63 feet of water, which is not even half of the total water level.

With the improvement in the technology there are many advanced devices and machines that are useful to the mankind. One of them is coin operated telephone. As we know the function of it and how it works.

With the same technology used we are going to design a project which is based on liquid (water). Coin Operated Water Dispensing System as the name indicates it is based on COIN operation. It has been specially designed for use on Railway station, Bus deposes, public places etc. And the system will take the power from 3 sources which are solar, battery and main power supply. This system is based on microcontroller. The inputs to the microcontroller are coin and output in the form of water. Looking at the specifications required for Water Dispensing System and for simplicity of our application, microcontroller was found to be best suited.

Tap Water v/s Bottled Water v/s Canned Water

Bottled water may have reduced amounts of copper, lead, and other metal contaminants since it does not run through the plumbing pipes where tap water is exposed to metal corrosion, however, this varies by the household and plumbing system. In much of the developed world, chlorine often is added as a disinfectant to tap water. If the water contains organic matter, this may produce other by-products in the water such as trihalomethanes and halo acetic acids, which has shown to increase the risk of cancer. The level of residual chlorine found at around 0.0002 g per litre, which is too small to cause any health problems directly. The chlorine concentration recommended by World Health Organization is between 0.0005 and 0.0002 g/L. [5]The Natural Resources Defence Council, Sierra Club, and World Wildlife Fund have urged their supporters to consume less bottled water.[Anti-bottled-water-campaigns and organizations, such as Corporate Accountability International, typically argue that bottled water is no better than tap water, and emphasize the detrimental environmental side-effects of disposable plastic bottles.

LITERATURE SURVEY

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.[2]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). According to history, the coffee vending machines emerged in the 50s since profits decreased and managers needed to reduce costs. They concluded that could save money by using coffee automatic machines (STEIN 1964). [3]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). [4]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.

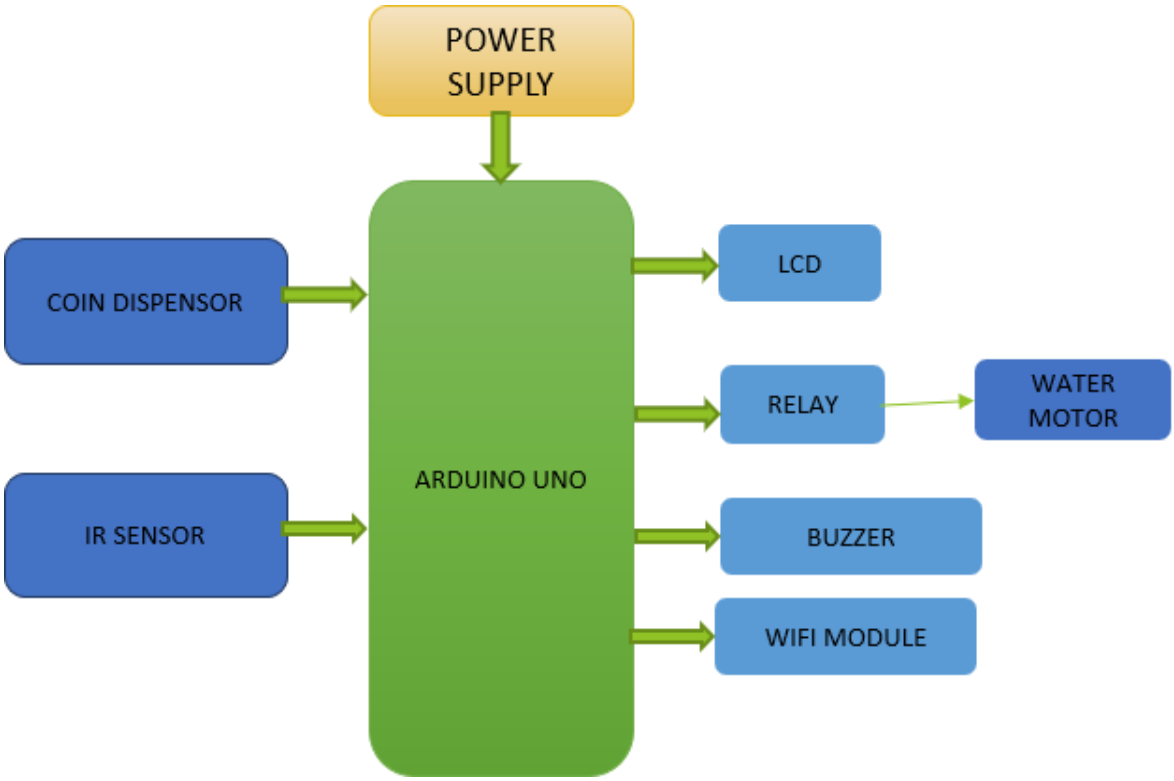
Regarding the evolution of the vending machine itself, in the ‘30s, there was the coin changers’

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.[4] Its clean look and beautiful design would be appropriate in cafeterias 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).

METHODOLOGY

Coin based Water dispenser management system proposed here it involves building of the smarter and automaticwater dispensers.[7]When coin is inserted water, water motor will be on for certain time and will be off after the time. These dispensers are built with the help of Arduino.[6] When the level of water left inside the dispenser reaches some calculated threshold value, then a notification is sent to the concerned authority through a mobile application. The mobile application then gets a push notification from the dispensers which are at a low level of water.[4]

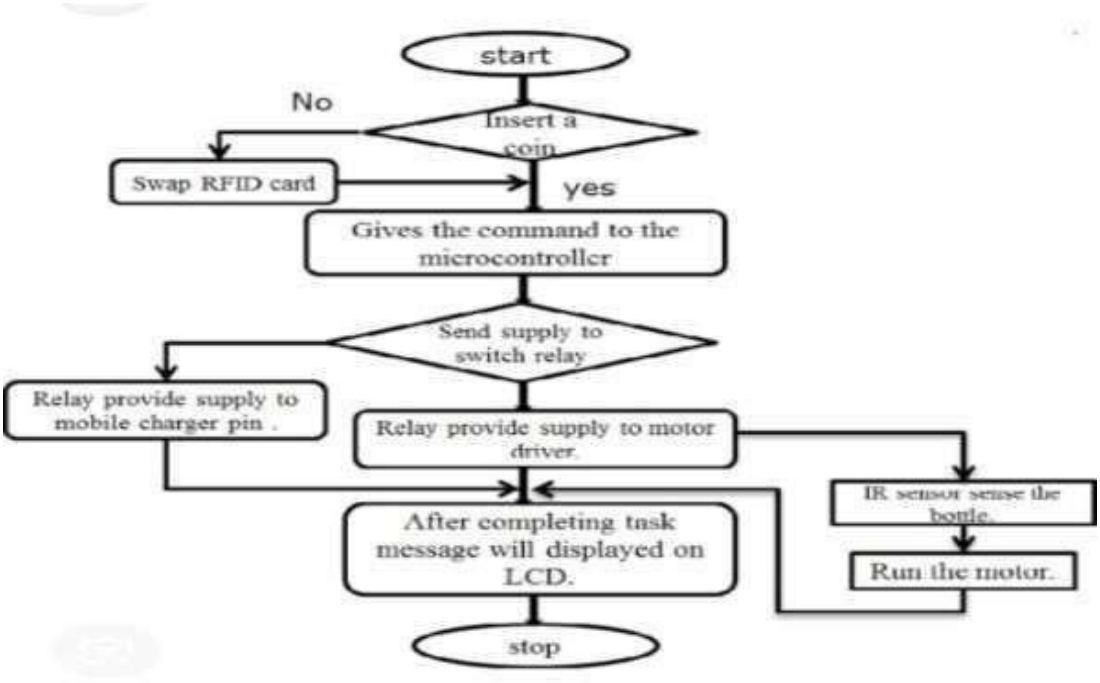
BLOCK DIAGRAM



Existing Vs Proposed System

Feature	Existing System	Proposed System
Glass detection	Ultrasonic sensor detects glass presence	Ir sensor detects glass presence
Water Dispensing	Dispenses water upon RFID card authentication	Dispenses water upon RFID card authentication
Water Limit	Dispenses 100ml water at a time	Dispenses 100ml water at a time
Limit Exceeded Warning	Displays message if water limit is exceeded	Displays message if water limit is exceeded
Addional Features	None	Coin detector,floating sensor,Wifi module

Flow Chart :



Existing and Proposed System

Combining Arduino Uno with various components like, floating sensor, or sensor, GSM module, water motor, Relay, Lcd display. Here's an outline of both an existing method and proposed method for automatic water dispenser system:

Proposed Method

1. **Arduino Board:** Utilize an Arduino board as the main controller for the system.
2. **Floating Sensor :** Incorporate a water level sensor, such as a floating sensor or a capacitive sensor, to detect the water level in the tank.
3. **GSM Module:** Integrate a GSM module to enable communication and remote monitoring/control of the system via SMS or a mobile app.
4. **Water Motor:** Connect a water motor to the Arduino board to control the flow of water.
5. **Relay:** Use a relay module to switch the water motor on and off based on the water level readings.
6. **LCD Display:** Include an LCD display to show real-time information such as water level, system status, and any alerts.

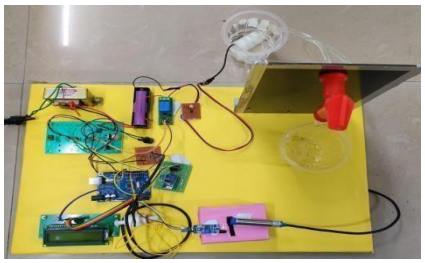
Existing Method

1. **Arduino Board:** Continue to use an Arduino board as the core controller for the system.

Ultrasonic Sensor: Replace the floating sensor with an ultrasonic sensor for more accurate water level measurements.

2. **WiFi Module:** Instead of a GSM module, integrate a WiFi module (such as ESP8266 or ESP32) for internet connectivity, enabling remote monitoring and control via a web interface or mobile app.
3. **Water Pump with Flow Sensor:** Upgrade the water motor to a pump with a flow sensor to precisely regulate water flow and monitor usage.
4. **Smart Valve:** Add a smart valve controlled by the Arduino board to regulate water flow more efficiently.

RESULTS



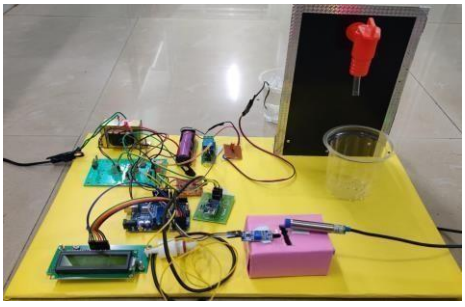
Front View of the Project

Water level is Low

Water Level is High

Wifi-Module Intializing

Water and Time levels



Back View of the Project

CONCLUSION

Coin-based water dispenser systems offer numerous advantages in terms of accessibility, hygiene, cost-effectiveness, and environmental sustainability. However, addressing challenges related to equitable access, maintenance, security, and evolving payment preferences is crucial for their effective implementation. Future research and advancements should focus on enhancing user experience, incorporating smart monitoring systems, and further improving the efficiency and usability of coin-based water dispenser systems.[2]By understanding the strengths, limitations, and potential improvements of coin-based water dispenser systems, stakeholders can make informed decisions regarding their adoption, ensuring the availability of clean drinking water and promoting sustainable practices in public spaces. [8]

Future Work

Future developments for an IoT-based automatic water dispenser system can focus on enhancing features, improving efficiency, and expanding capabilities. [2]Advanced sensors can monitor water quality parameters such as pH and turbidity, alerting users to unsafe conditions, while predictive analytics optimize water usage and maintenance schedules. The user experience can be improved with voice control integration, customizable dispensing options, and a more intuitive interface. Energy efficiency can be boosted by integrating solar power and energy-harvesting technologies. Upgrading to 5G connectivity will enhance real-time monitoring, and implementing advanced encryption methods will ensure data security. Scalability can be achieved through smart home integration and modular design, allowing easy upgrades and component replacements.[3] Health and safety features, such as automated sanitization and leak detection, will ensure hygiene and prevent water wastage. Data integration with health apps can help users track hydration, while community features promote healthy habits. Cost reduction can be addressed by using affordable components and offering DIY kits. Using eco-friendly materials and incorporating water recycling features will reduce environmental impact. The system can be adapted for commercial and industrial applications, providing large-scale water management and monitoring. Portable versions can be developed for emergency response, ensuring access to clean water in disaster-affected areas. By focusing on these areas, the automatic water dispenser system will evolve to meet future demands, offering enhanced functionality, user satisfaction, and positive environmental impact.

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