# IOT BASED SMART AUTOMATIC JUICE VENDING MACHINE

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**Abstract-***The Proposes of this project is to design of an IOT based Automatic Juice vending machine. This project is based on Internet of Things (IOT) which aims to provide a smart juice vending machine for the people. And it Provides a different kinds of fresh and cool juice. This vending machine reduces the human efforts. A juice vending machine is a machine that gives out different kinds of fruit juice when a person inserts a coin into it, therefore it is a coin based vending machine this project is implemented using 8051 microcontroller. This vending machine is an automatically operated juice extractor. This Vending machines makes it easier for making small purchases, it occupies less space and it doesn't need any continuous monitoring .The operation should be easy with good efficiency. The machine should cost less and easy to manufacture. In this vending machine A solenoid valve is used for juice dispense, and juice level sensor is used for measuring the juice level in reservoir tank. A temperature sensor is used for measuring the temperature of juice and if temperature goes high above the threshold value then cooler is activated for cooling the juice. The data are sent wirelessly to the cloud over the internet using ESP-8266.ThingSpeak, IOT Geek, etc., are the various IOT cloud platform available on which data is displayed, visualized and store securely. In this way records are stored digitally and is easily accessed and analyzed by the owner.*

*Keywords – 8051 microcontroller, coin sensor, Solenoid valves, Temperature Sensor, Level sensor, ESP-8266*

## 1. INTRODUCTION

The vending machines first came into the market in the 18th century, and then modern vending machines came up in the 19th century with the help of modern technologies. The word vending is a Greek word, which means selling. The Juice Vending machine is simply a machine, which works automatically and can sell out various kinds of drinks like juices, soda water, plain water etc. Therefore, it is also known as Automatic Dispense Machine. These machines are more reliable, easily accessible and much more practical than the convention method of purchase. Nowadays these machines are found almost Everywhere like at schools, offices, small restaurants for selling snacks and drinks, even found at railway stations for selling tickets and thus avoiding the queue and in turn saves time. This machine has a huge market with high annual revenues for both developed and developing countries. Gradually, vending machines became a wide channel with increase in sales and even the competition between the manufacturers. It does have many benefits, first benefit is in terms of setup, it is easy to setup a vending machine because it occupies very less space and is compact in size, it is a low cost driven machine and can provide various products as the output.ATM (Automatic Teller Machine) is the best example of technology evolution in terms of vending machine in an engineering field. ATMs reduces the time and human efforts required to search, recognize and stand in a queue for cash payments and even for cash withdrawals.

### 1.1 Problem Statement

The Vendor sells the juice manually which cause the human efforts and their hard work. And this will consume more time.  The quality of the juice is not so good for the health.

### 1.2 Objective

The main objective of this project to design and development of automatic juice vending machine which will reduces the human efforts and this will saves the time also. And the quality of juice is also improved. This machine will work smartly and it measures the temperature, level of juice .and it alert the vendor if the level of the reservoir goes below the threshold level. And all the data is sent and stored to the cloud by which the vendor can visualized, analyzed the record.

## 2. Methodology

### 2.1. Block Diagram

Fig. 2.1 illustrates the overview of the system. This block diagram consists a Microcontroller, Reservoir tank, juice level sensor, juice temperature sensor, coin inlet, coin return outlet, push button, LCD display, solenoid valves, cooler, motor, Wi-Fi module.

The Microcontroller is the backbone of the system these sensors and valves, esp8266 is interfaced with microcontroller the reservoir tank is used for storing the different kind of juice which is further connected to the solenoid vales. The solenoid vales

is opens and closes electrically .when the pulse is applied to the solenoid vales then it's get activated and it turns on. And at the outlet we will get the required juice, otherwise the solenoid valves remain off and at the outlet we will nothing. The temperature sensor is used to measure the temperature of the juice if the temperature of the goes above the threshold temperature then the cooler will get activated and it will start cooling the
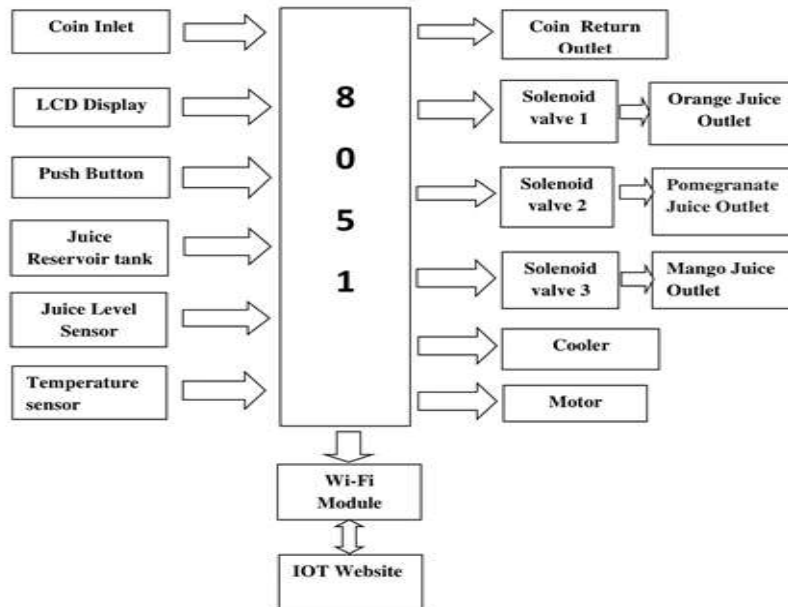


Fig-2.1

juice to threshold value of cooling temperature, and then it stopped cooling the juice.LCD display is interfaced with the microcontroller and it used for displaying the menu and also for the indication purpose .the coin inlet is used for the inserting the coin. And a coin sensor is used for the validation of coin. And coin outlet is for returning the extra money. Push button is used for selecting the menu option of vending machine. And Wi-Fi module that is esp8266 is interfaced with microcontroller which is used to connect the microcontroller to the cloud for sending the data to the cloud over the internet.

## 2.2 Flow Chart

Fig 2.2 illustrates the flow chart of this project. When we start the system the system is initialized and gets activated and it starts display "Welcome to Automatic Juice Vending Machine" and it also displays the Menu. When the user press the menu button then it will display the menu option i.e.- Press 1- For Orange Juice, Press 2 –For Pomegranate Juice and Press 3- For Mango Juice. Now when the user select and Press any one button from these option then system will check which button is pressed and according to that it will display the selected option on the screen of the LCD display. Then the system will display "Please insert the coin and it will also display the price of the selected juice, And when the user will inserted the coin the system will check validates the coin if the inserted coin is equal to the selected juice price then it will display 'ok', and the system will opens the select juice  outlet valve and displays on the screen 'Please take your juice  and if the inserted coin is greater than the selected juice price then it will takes the required amount and extra amount is returned back through the coin outlet and the also display on the screen ;Please collect extra amount from coin outlet and then it will then open the selected option valve. And if the inserted coin amount is less than the selected juice price then it will display on the screen of LCD display 'Please Enter the Valid amount. Now when the selected juice is dispensed through outlet then the system will restart.
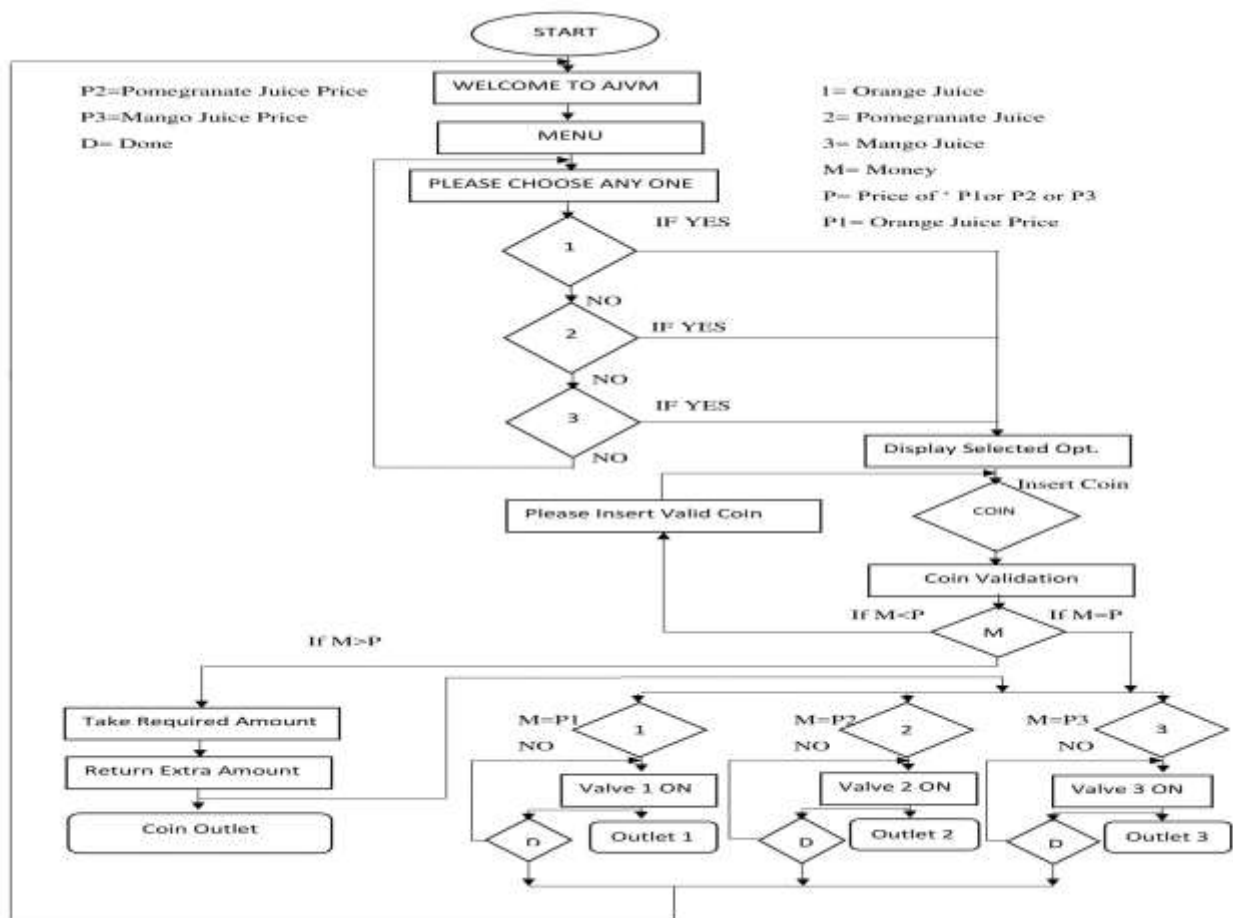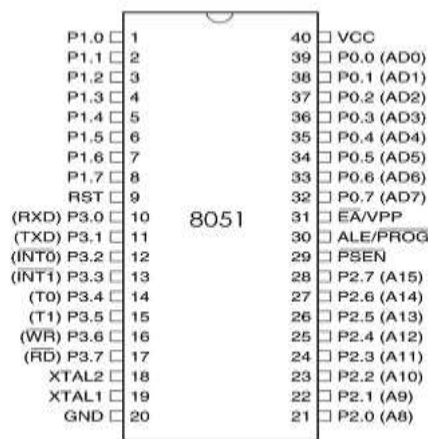
Fig-2.2

## 3. Hardware

The system hardware has many units which are sensors, Microcontroller, LCD Display to display the values and data, Wi-Fi module through which the data is sent and receive wirelessly over the internet. The list of hardware is as follows:

### 3.1 Microcontroller



Fig-3.1

Microcontroller has all the necessary components which a microprocessor possesses and invariably it poses ROM, RAM, Serial Port, timers, interrupts Input Output ports, and clock circuit. The microcontroller always focus on the chip facility and it is more prominent in the case of serial ports, analog-to-digital converters, timers, counters, read only memory, parallel input, interrupt control, random access memory and output ports.

### 3.2 LM35 Temperature sensor
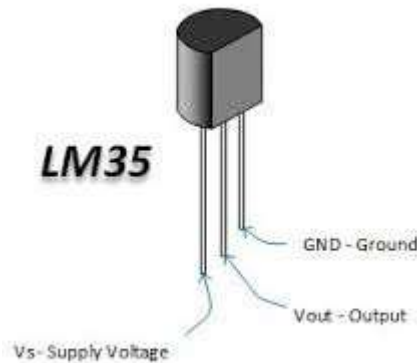


LM35 is a precession Integrated circuit Temperature sensor, whose output voltage varies, based on the temperature around it. It is a small and cheap IC which can be used to measure temperature anywhere between -55°C to 150°C. It can easily be interfaced with any Microcontroller that has ADC function or any development platform like Arduino. Power the IC by applying a regulated voltage like +5V ($V_S$) to the input pin and connected the ground pin to the ground of the circuit

### 3.3 ESP8266 Wi-Fi Module



Fig-3.3

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. The ESP8266 can be controlled from your local Wi-Fi network or from the internet (after port forwarding). The ESP-01 module has GPIO pins that can be programmed to turn an LED or a relay ON/OFF through the internet. The module can be programmed using an Arduino/USB-to-TTL converter through the serial pins (RX, TX)

### 3.4 Coin Detector

The coin acceptor use the thickness, diameter and fall time of the coins to identify them and it's fully programmable so you're not limited to any particular type of currency. Simply use the buttons and 7-segment display on the side of the unit to select a coin profile, insert a bunch of coin samples (or the same one, over and over) then designate the value. After you've programmed

the coin profiles, simply read the serial output of the coin acceptor and it will tell you the value of each coin as they're inserted. It reports these values as binary bytes and the baud rate is selectable on the unit.

This coin acceptor also has a coin reject, so your controller can tell the coin acceptor not to take any more coins, as well as a (very loud) alert beeper. All you need to get the coin acceptor working is a pocket full of change, a 12VDC supply and somewhere for the change to fall after it's accepted.



Fig-3.4

## 3.5 Solenoid Valve

A Solenoid valve is used wherever fluid flow has to be controlled automatically. They are being used to an increasing degree in the most varied types of plants and equipment. The variety of different designs which are available enables a valve to be selected to specifically suit the application in question. Solenoid valve is a control units which, when electrically energized or de-energized, either shut off or allow fluid flow. The actuator takes the form of an electromagnet. When energized, a magnetic field builds up which pulls a plunger or pivoted armature against the action of a spring. When de-energized, the plunger or pivoted armature is returned to its original position by the spring action.



Fig-3.5

## 3.6 LCD Display

LCD modules are very commonly used in most embedded projects, the reason being its cheap price, availability and programmer friendly. Most of us would have come across these displays in our day to day life, either at PCO's or calculators. LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7 pixel matrix.

Fig-3.6

## 4. Software

### 4.1 µVision Keil IDE

The µVision Keil IDE combines project management, run-time environment, build facilities, source code editing, and program debugging in a single powerful environment. µVision is easy-to-use and accelerates your embedded software development. µVision supports multiple screens and allows you to create individual window layouts anywhere on the visual surface. The µVision Debugger provides a single environment in which you may test, verify, and optimize your application code. The debugger includes traditional features like simple and complex breakpoints, watches windows, and execution control and provides full visibility to device peripherals

### 4.2 Thing Speak

Thing Speak Thing Speak is an IOT analytics platform used to collect the data from sensors and turn it into useful information, analyze and visualize the data, and control the system using Internet. Using Thing Speak the data can be sent to cloud from any Internet enabled device. Channels, tools, Webpages are features provided to control the system. Channel is where all data of application is stored and each channel contains 8 fields to contain information, URL field to link webpage, location field, etc. Once the channel is created the data can be accessed by a read key if it is kept private (default). But if the channel is set to public, read key is not required. Real time data is obtained from the sensors which is received and transmitted in the form of Hypertext Transfer Protocol (HTTP). Then the data is uploaded on the cloud from where it can be used for various purposes. The data is stored and updated on Google sheet. Triggering levels can be set and alert messages are sent using SMS/Mail to the contact number/E-mail id mentioned. By using commands or certain options messages are sent to the objects to perform various tasks. Using visual tools, the real time data can be visualized in form of graphs, statistical distribution etc.

## 5. Conclusion

This automatic Juice vending machine offer Variety of product as well as many Payment option. In the recent time use of digital is increasing day by day due to their accuracy and feasibility. Due to time saving feature people can use vending machine in busy area like airport, bank, office, market etc. This system is Portable, affordable, consumes less power and can be made easily available so that the user can use this system whenever and whatever.

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