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Smile-Activated Vending Machine Using AI & IoT

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ABSTRACT

The project proposes a smile-activated vending machine using Artificial Intelligence and IoT technology. The market for interactive electric products is steadily growing. To ensure this, we are trying to correlate Artificial Intelligence to a vending machine, the user's smile triggers the output of vending machine using IoT technology. Our project's key goal is to introduce new technological applications into society and to spread smile while purchasing a chocolate as we know smile is the messenger of our soul's well-being. As of now most of the people in the world are getting depressed day by day. The use of a vending machine that responds to a smile is beneficial to the environment which helps the customer to order the chocolate as well as make the customer grin. They simply need to choose the type of chocolate they want and press the order chocolate button. Before they are emptied into the machine, the amount of ingredients is continuously monitored. The concerned department receives a notification warning and is instructed to fill the appropriate ingredient. It aims to improve the overall management of the chocolate vending machine, which previously operated on a coin-based system. These devices can be built in a variety of ways, but the Arduino microcontroller, python libraries of Open Computer Vision (OpenCV) and TensorFlow for smile detection was used in this project.

Keywords: *IoT, ESP32 CAM, Vending machine, AI, Servo motors.*

1. Introduction

Vending machines that are keen, eye catching and does ponders for existing and new clients. These insightful machines give a scope of items to clients utilizing an eye catching intuitive mixed media show [1]. In order to brighten up the world with people's smile, we are designing a smile activated vending machine which can be used in various locations such as schools, hospitals, and malls for both marketing and social service purposes [2]. Here the winners are grinners, vending machines give various advantages to clients and administrators the same. These machines normally furnish clients with the comfort of self-administration and 24 hour access [3]. In like manner, administrators profit by the capacity of vending machines to make mechanized marking of product to clients, frequently at unpredictable areas and seasons of day, without significant work costs [4]. Also, vending machines give a helpful component to item makers to present and test new items.

The vending system should offer productive assistance with zero capacity to bear human mistake, require no client preparing and be available to a wide scope of clients [5]. Client conduct examination by item interface directs the client's conduct is the way to tackling some down to earth association plan issues [6]. IoT is groundbreaking for computerized promoting. All items, from a jug of pop, to your watch, to your cooler, to your vehicle will can possibly serve media of some sort. Publicizing will turn out to be profoundly close to home and will be coordinated decisively at clients.

2. Existing System

This existing system proposed the idea of an Automatic Chocolate Vending Machine using IoT technology with ThingSpeak cloud platform [7]. The execution of IoT based vending machine assists the client with requesting the chocolate. The principle intention of the plan of automatic vending machine using IoT is to plan a minimal effort, successful vending machine [8][9]. The vending machine chips away at the basic

standard, the client pay to the machine as coin and machine will return back the chose products. Hence is called as the automatic dispense machine [10]. The central part of this proposed system is developed with the help of Arduino ATmega328 microcontroller. In this one of the main sections is coin inserting and sensing. And based on the coin insertion the user will be able to enter the required quantity and program verifies whether input quantity valid or not [11]. The present smart vending machines offer enormous freedoms for business change through the Internet of Things (IoT) and cloud-based advances. Vending machine proprietors and administrators can anticipate more compelling approaches to connect with clients, increment deals, and set aside cash through far off administration and prescient maintenance [12].

Progressed information examination assists them with bettering match machines and stock to every area, just as acquire important experiences on the adequacy of advancements, evaluating, area, climate, season, and different elements [13]. The execution of IoT based chocolate vending machine assists the client with purchasing the chocolate. They simply need to choose the desired chocolate they need and simply click on the respective button and it will directly give the chocolate by rotating servo motors [14]. The quantity of item is ceaselessly observed. The warning alarm is shipped off to the respective administrator to fill the shortage of chocolate at any case [15].

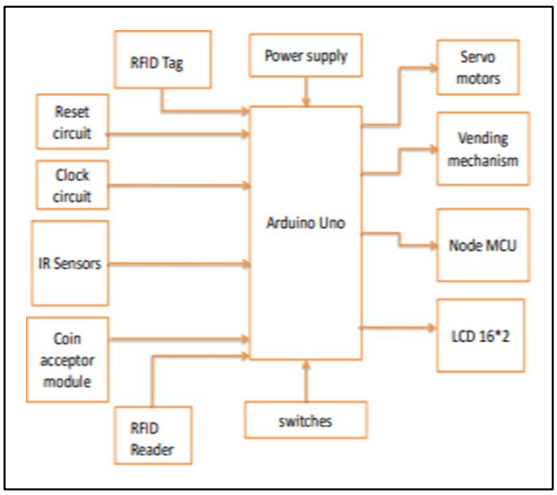

Fig.1. Automatic Chocolate Vending Machine Block Diagram

3. Proposed System

To make the normal vending machine to be more interactive, here the user's smile triggers the output of the chocolate vending machine. We are adding facial recognition to include smile detecting feature which makes the vending machine more attractive towards users. It features four discharging units. The quantity of taken chocolate data will be stored in ThingSpeak cloud for analytical purpose. For smile detection we are using Python libraries of OpenCV and TensorFlow along with Haar Cascade classifiers and NumPy.

Bliss may very well be in excess of a compound response. A glad client is bound to stroll through the entryway once more, and information on joy can assist organizations with understanding which items would improve and have a higher standard for dependability. Machines can figure out how to perceive bliss and grin by facial acknowledgment innovation utilizing AI on the face, it's for the most part through our eyes and grins.

We normally gather that somebody is cheerful when we see a grin all over. A grin can have numerous varieties; however, its shape is generally like a compliment sort of 'U' formed figure. The Viola-Jones calculation utilizes haar-like highlights to recognize facial properties. The course is a progression of channels that will apply consistently to recognize a face through its highlights. These channels are put away in their own XML documents in the Haar Cascade GitHub Repository.

TensorFlow is an AI/profound learning/multi-facet neural organization library from Google. Libraries utilizing information stream charts can be utilized to depict complex organizations in a straightforward way. With high adaptability, it very well may be utilized from the examination level to genuine items. TensorFlow fundamentally portrays all computation measures by estimation chart, regardless of how basic the computation is. Hence, some commonality is needed to deal with it. Furthermore, TensorFlow can perform circulated figuring out how to function in any climate like iOS and Android. Circulated preparing permits TensorFlow to deal with a lot of information like enormous information.

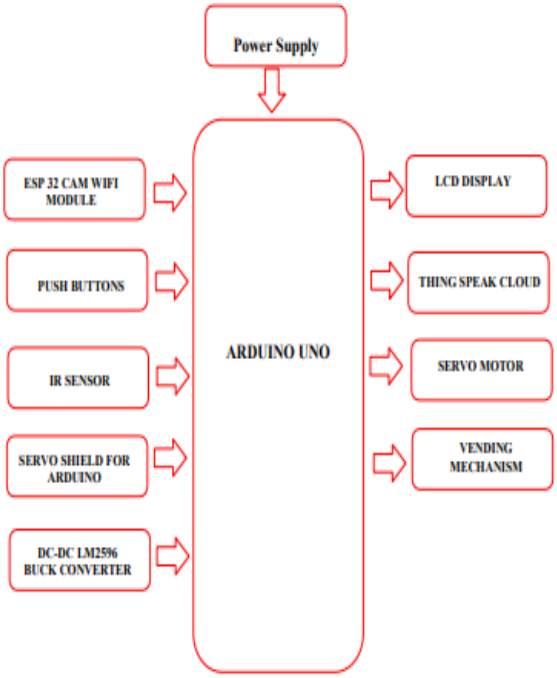

Fig.2. Smile Activated Vending Machine Block Diagram

At first, the ESP 32 CAM module live stream the user's face using the webcam server using camera module. Meanwhile Python OpenCV will detect the user's smile using Haar cascade classifiers once it detects the smile, the consumer just needs to select the type of chocolate they want from the displayed items, and then just click on button respective to the selected chocolate and get the chocolate. This instruction directly fetches to the Arduino, then Arduino make action on it and gives output at the dispense mechanism. That particular chocolate displays on the LCD display. Once the selection button pushed, the servo motors will start to rotate the chocolate carrying spring then the desired chocolate will be delivered to the consumer. During this process the IR Sensor will monitor the quantity of chocolate and send data to ThingSpeak Cloud. Once the particular type of chocolate gets emptied it will automatically send alert to the concerned proprietor to refill the vending machine. Serial is used for communication between the Arduino board and a computer or other device. To

exchange the information between the Arduino board and other device modules we need serial communication ports. All Arduino module rather have a single serial port which contains to digital pins of receiver and transmitter which transmits the information with the medium computer USB. For using these functions, we must not use receiver and transmitter pin as digital input or output. Face location utilizing Haar falls is an expert system based methodology which is computationally expensive but more accurate.

OpenCV as of now contains numerous pre-prepared classifiers for face, eyes, grins, and so on. A face appearance contains a rundown of directions for the rectangular space where appearances were found. We utilize these directions to attract the rectangular shapes of our picture. ThingSpeak is a freemium IoT platform which helps us to live stream the numerical and string data and graphs. ThingSpeak give live updates of the task while on its operating and non-operating condition on any devices. ThingSpeak is accessible as a free assistance for non-business little tasks.

A. Arduino UNO

Arduino is a microcontroller which gives great control to other task through user system. It consists of a freely available Arduino IDE for editing codes based on different boards and chip modifications [16]. The IDE coding can be done by C language. It extends other languages using various library options. With the help of Arduino board we can build up project using various electronics modules also it has the repository of examples for various electronic components which makes it handle easily. After the coding part, for execution we need to wire the board with required components.

For each device the required library need to be mentioned at the top of the Arduino program and also the port must be selected [17]. A few boards are intended to be installed using boards manager feature and have no programming interface (equipment) which you would have to purchase independently. Some can run straightforwardly from a 3.7V battery, others need at any rate 5V [18].

B. ESP 32-Cam Wi-Fi Bluetooth Camera Module

The ESP32-CAM is a full-included microcontroller that likewise has an incorporated camcorder and microSD card attachment. It's modest and simple to utilize, and is ideal for IoT gadgets requiring a camera with cutting edge capacities like picture following and acknowledgment [19]. Utilizing the ESP32-CAM is like utilizing the ESP32 modules with one significant distinction. The ESP32-CAM board has no USB port, so you can't simply interface it up to your PC and begin stacking programs. All things considered; you should add an outer USB TTL connector [20]. The ESP32-CAM is based upon the ESP32-S module here we are using Ai-Thinker module, so it shares the same specifications. It has the accompanying highlights:

- Ultra-small 802.11b/g/n Wi-Fi
- Supports TF Card
- Supports interfaces such as UART/ADC/DAC
- Built-in 520KB SRAM, external 4MB PSRAM

- Up to 240 MHz, up to 600 DMIPS
- Low-power dual core 32-bit CPU
- Supports for images Wi-Fi upload

C. Micro Servo Motor

Nonstop Rotation 360 Degree Servo Motor is extraordinary among every one of the accessible servo engines since its activity is altogether different from that of a standard servo[21]. As opposed to going to a predetermined point, this servo will be static at a 1.5ms beat, a more extended pulse gives forward revolution and a more limited pulse give in reverse pivot.

Digital Servo Motor operates by the receiving pulse width modulation signals. These days, servo frameworks are utilized generally in mechanical applications. Continuous Servo has high torque which helps the spring to rotate on vending machine with accurate positioning. Along these it offers fast control response, constant force all through the servo travel cycle, excellent holding power. The servo engine is not normal for a standard electric engine what turns over turning as when we apply capacity to it, and the revolution proceeds until we switch off the force.

4. Methodology

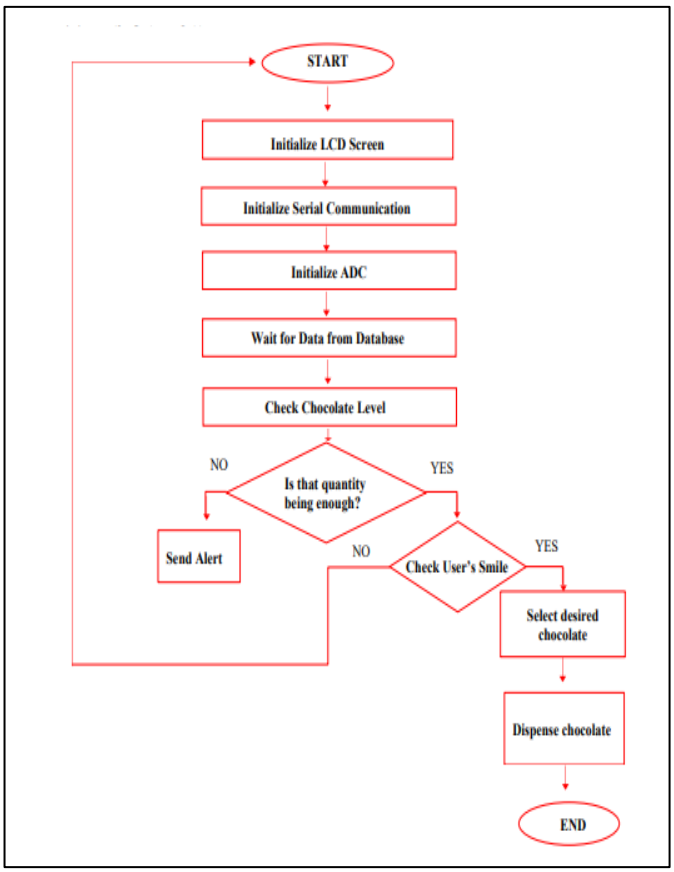

Fig.3. Smile Activated Vending Machine Block Diagram

Step 1: The system first initialize the LCD screen for user interface.

Step 2: In t backend, it will initiate the serial communication with ESP 32 CAM module

Step 3: After that, it will monitor the chocolate quantity level to check whether is enough to proceed the task.

Step 4: If the quantity level is up to the mark of dispensation, it will proceed the next task or else it will send an alert to its owner to refill the machine.

Step 5: Now, it will check the user's smile if it is wise smile enough, it will dispense the desired chocolate, if not it will ask the user's to redo the task

Advantages

- Advertising the newly released products.
- Reduces more investment on advertising.
- Entertaining the people in hospitals, schools, malls etc.
- Reduce the stress of people.

5. Simulation Results

Fig.4. Smile detection using python OpenCv

When the user starts smiling it will be detected using OpenCV python library which will automatically detect the user's smile along with tensor flow and numpy libraries.

Fig.5. Smile-Activated Vending Machine

6. Conclusion and Future Scope

As a result of this project, this smile activated vending machine will draw the attention of children to adult. It will attract a greater number of customers and would be a center of attraction in schools and child hospitals as well as psychiatric hospital. It'll give best branding of newly arrived products in malls and many commercial trade places because of its interactive nature. In future, touch – panel dashboard will be used to make it more user friendly interface other than push buttons for taking goods. By extending the space of the vending machine by adding more layers we can extend the storage space. Further we can capture smiling images of the users and will add a feature for posting that snaps on social media with user's concerns.

More accurate smile detection can be implemented using more computational algorithm to detect the smile of cerebral palsy victims and for the people who affected by facial disabilities.

Declarations

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Competing Interests Statement

The authors declare no competing financial, professional and personal interests.

Consent to participate

Not Applicable

Consent for publication

We declare that we consented for the publication of this research work.

Availability of data and material

Authors are willing to share data and material according to the relevant needs.

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