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Smart Bartender Using Raspberry Pi

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Abstract *– As the era of modern living paved its way to society, the world itself underwent a lot of changes that led to the introduction of modern technologies, to various life-changing innovations and inventions. Today's technology offers commercial businesses as well as home-based consumers to experience various food machinery in a highly efficient, very accessible way. These are made to eliminate the manual process of preparing foods thus conserving time; and allowing consumers to have exact replicas of their foods. This paper reflects the benefits of having a smart bartending machine; instead of the traditional way of preparing drinks. This study developed a Smart Bartender, a machine capable of mixing drinks in precision with a friendly user interface to help bars to be more productive and also normal consumers who don't have the skills in mixing alcohols. The Smart Bartender is running on Raspberry Pi with its GUI made using Tkinter. Based on the tests conducted by the researchers, the commands were executed by the machine correctly. The results have shown a high precision when it comes to ratio and proportion. The researchers believe that Smart Bartender benefits the bar owners to be more productive in the field with lesser labor hours and the normal consumers to have great entertainment.*

Keywords *– Bartender, Raspberry Pi, Smart, Microcontroller, Touchscreen*

INTRODUCTION

Smartphone screens are one of the best and initiative inventions in the 21st century that continue to extend their reach. Their forms are being replicated in various forms and applications; designers find their way to apply them in our homes, hospitals, and business.

In the present era, designers strive to create the simplest yet functions the best. The bulky knobs and buttons that once filled our electric devices at home are now replaced by tablet-sized smooth panels that control various appliances at home and different devices in commercial and medical fields.

The Touch panels give the appliances a new layer of convenience — they're simple to understand, clean easily, and have long working lives — while offering users the same certainty as knobs and buttons. These touch switches on control panels are both intuitive and attractive, and their inclusion in home appliances, as well as in cars and industrial settings, is leading to easy interaction between appliance and user (Mason, 2016).

For these reasons, the researcher came up with the proposed study, the Smart Bartender powered by Raspberry Pi. The researchers are tapped into the influence of those intuitive taps, swipes, and presses, and applied them in the Smart Bartender.

This project is powered by a Raspberry Pi, a Smart bartender that serves both drinks. The body of the mixer was built from acrylic and, like a lot of the bartending robots that have gone before; it used peristaltic pumps to move the ingredients around the bot. It makes drinks by mixing up to 5 ingredients together at the same time and it can have anything from a rum and coke to a long island iced tea. It can be customized to make any number of drinks, and it can be expanded to mix more ingredients.

With this project, drinking and mixing alcohol or any beverages you want can be done with ease and convenience. This project is expected not to only prosper in the business field. This liquid supply system can be used also for mixed preparation in public catering establishments, such as bars, as well as for home use. With the flexibility and scalability of the system, it's possible to apply it in various human activities, where fine dosing of liquids is required, like for beverage mixing, cooking, health, and medical applications. By using open architecture and software, this system can be built in a smart home environment. The cross-platform control software and an embedded Bluetooth module can allow the development of various setup and case scenarios.

The study aimed to construct a Raspberry Pi Smart Bartender. This prototype takes instructions from the user by choosing from the touch screen monitor where the user can view the existing drinks or create their drinks with their preferences, the smart bartender prototype then will perform the required action.

MATERIALS AND METHODS

A quantitative approach was followed. Burns & Grove (1993:777) defined quantitative research as a formal, objective, systematic process to describe and test relationships and examine cause and effect interactions among variables. Most quantitative research

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falls into two areas: studies that describe events and studies aimed at discovering inferences or causal relationships. Using this method, the measured output volume of the machine in different commands is compared to the desired output volume. The time it takes to finish these different tasks were also gathered as well as its responsiveness to the commands. This will find out if the machine will function according to the first and second objective: to be able to construct a Smart Bartender with Touch Screen Display monitor and Self-operating measurement system and is to be able to create a Modular design that allows you to customize your Mixer to include as many ingredients and drink combinations as you choose.

The information obtained from previously related projects, thesis, articles, and research development of Smart Bartender played a major role in the construction of ideas of the said project.

Sources of Data

The researcher utilized the following in gathering the necessary information for the construction of the project:

Library. Books, magazines, and thesis are some of the materials used as reference or guide in developing the study. The researcher makes time to visit the library to read some of the related studies which were used as a guide in constructing and doing the study.

Internet. The researcher also accessed the internet to gather information in books and internet sites, having the same concepts as to the research that would help and find other related articles and studies which will be needed to enhance the researchers' knowledge on the study and for the accomplishment of the objectives of the project.

Consultation. The researcher also asked and seek help from the experts. With this, the researcher got an overview of the possible features and capabilities of this project to be made.

Instrumentation and Data Collection

To test the flow rate of each pump, the proponents used water as a liquid sample. The pumps were powered with 12volts and were switched for one minute, pumping water to a measuring cup. The proponents then gathered how many milliliters of liquid was pumped.

For the taste consistency, the proponents gathered ten participants as a taster. Each was asked to drink 30ml each of the four mixtures and rate them in terms of sweetness, alcohol concentration, and flavor, from 1 to 5, where 1 being the lowest and 5 being the highest.

Tools for Data Analysis

The different data that was collected through research, the internet, and consultations, and by any other means were verified and further analyzed during the testing and troubleshooting processes. These validate the principles, concepts, and theories regarding the project.

Flowcharting is a tool used for the improvement of processes. By providing a graphical representation, it helps to identify the different elements of a process and understand the interrelationships among the various steps.

A Block diagram is a diagram of a system in which the principal parts or functions are represented by blocks connected by lines that shows the relationships of the blocks. It enhances understanding of the process by showing all involved parts and how they are interconnected in an easy-to-follow format and it provides a quick, visually clear view of the work and rapidly leads to process points of interest. Application Software is a software tool that functions to support and improve the user's work.

RESULTS AND DISCUSSIONS

The project is composed of two parts, these are the hardware and the software. The hardware includes the materials needed for the physical part of the project. These are Raspberry Pi which is the brain of the whole project. It provides a set of General-Purpose Input/Output (GPIO) pins that allow the user to control the other components involved in the project for physical computing or functioning.

Programming is one of the essential steps to make the Bartender smart, the researcher creates its codes in making GUI using Tkinter. With proper knowledge and research, the researcher succeeded in programming and running the programs to Raspberry Pi. The program allows the researcher to achieve the desired response of the Smart Bartender.

To ensure that the project is working accordingly, the researcher provides two weeks for testing and evaluation. The researcher observed the responses of the components and as well as the program.

Some programs and components are flawed and the researcher allotted two weeks shorter to troubleshoot and solve the problems in the system of the Smart Bartender.

These activities were done on time and everything went well during the construction of the whole project. With this, the project is now ready to serve its users.

The Smart Bartender has a touch screen panel that allows the users to interact with it. The users will choose what drinks they prefer and press the GUI created via Tkinter which shows the menu and drinks they can mix. If the users touched the existing mixed drinks, the system will ask the users to wait and run the pump, however, if the users touched the unmixed drinks, the amount of ingredient will depend on how long the

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users press the button.

Figure 1 below shows the Graphical User Interface in the touch screen panel, there are four mixed drinks, upon pressing the desired drink the smart bartender will serve the user with 180ml of that drink, however, if the unmixed drinks are chosen the smart bartender will serve a certain amount of drink based on how long the button is pressed. It used the concept of computing the volume with respect to time. The volume will be based on how long is the button is pressed, at this instance, the users are responsible for the number of drinks they want.

Figure 1. The Graphical User Interface (GUI) Design

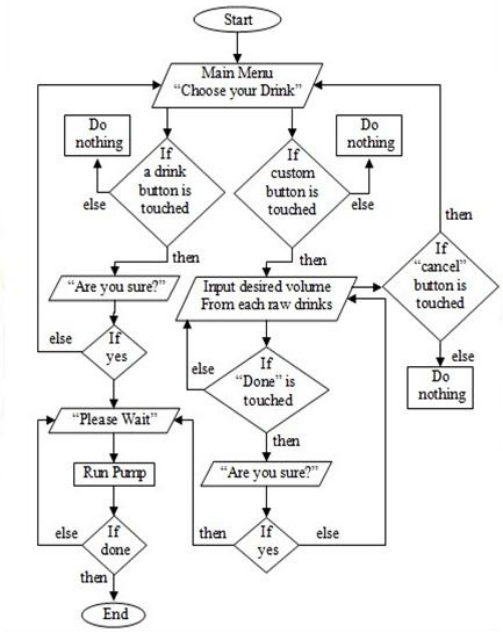

Figure 2. Flow Chart

The researcher chooses Python as the programming language in doing the project. Also, by using Tkinter as a standard Python interface, the GUI or Graphical User Interface for the system was made possible. The touch screen panel displays the button labeled with different mixtures of drinks and unmixed drinks that allows the users to control the General-Purpose Input/Output (GPIO) pins of Raspberry Pi. The Raspberry Pi is the brain of the project, it is responsible in powering pumps at a certain amount of time to get the desired mixture that the users preferred. The GPIO pins can't supply enough power to the pumps so, the researcher connected a 12 V from the power supply to the pumps.

Table 1 below shows the obtained flow rate for each pump gathered in one minute using water as a sample.

Table 1. Flow Rate of Pump

Pump	Flow Rate (ml/min)
1	79.8
2	80.2
3	79.5
4	79.2
5	80.1

The raw drinks that were used were Gin, Sprite, Soju, Pomelo juice, and Yakult, from pump 1 to pump 5 respectively. All alcohol mix choices were programmed to be 180ml. Table 2 below shows the mixture components in milliliters.

Table 2. Alcohol Mix

	Gin	Sprite	Soju	Pomelo Juice	Yakult
GinPom	45			135	
Soju Yakult		30	100		50
Gin Fizz	45	135			
Gin Mix	90	45		45	

Table 3 below shows the mixture components in milliliters. The data collected on ten tasters were summarized in the succedding tables: Rate 1(lowest) and 5(highest)

Table 3. Taster Result for GinPom

Taster	Sweetness	Concentration	Flavor
1	5	5	5
2	4	4	5
3	5	5	5
4	4	4	5
5	5	4	5
6	5	4	5
7	5	4	4
8	5	5	4

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9	5	5	5
10	5	4	4

Table 4. Taster Result for Soju Yakult

Taster	Sweetness	Concentration	Flavor
1	4	4	2
2	3	4	2
3	3	4	2
4	3	4	2
5	3	4	2
6	3	4	3
7	4	4	2
8	3	4	3
9	3	5	2
10	3	5	2

Table 5. Taster Result for Gin Fizz

Taster	Sweetness	Concentration	Flavor
1	5	3	5
2	5	3	5
3	5	3	5
4	5	3	5
5	4	4	4
6	5	3	5
7	5	3	4
8	5	3	5
9	5	4	4
10	5	3	5

Table 6. Taster Result for Gin Mix

Taster	Sweetness	Concentration	Flavor
1	4	5	5
2	4	4	5
3	5	5	4
4	3	5	4
5	4	4	4
6	4	4	5
7	5	4	5
8	5	3	5
9	5	4	5
10	4	5	4

The important hardware used to create the project is the following: Raspberry Pi, peristaltic pumps, relay, touch screen panel, and power supply. The software used was the Raspberry Pi IDE.

The Smart Bartender ensures its bias by maintaining a constant flow rate at a given time. The obtained flow rate for each pump gathered in one minute using water as a sample ranges from 79-80ml making it accurate. The Smart Bartender ensures its repeatability by consistently producing the same concentration of drinks. Based on the data gathered with the 10 tasters it showed consistent results.

CONCLUSION

Smartphone screens are one of the best and initiative inventions in the 21st century that continue to extend their reach. With the touch panels feature that can give the appliances a new layer of convenience — they're simple to understand, clean easily, and have long working lives — while offering users the same certainty as knobs and buttons. For these reasons, the researcher came up with the proposed study, the Smart Bartender powered by Raspberry Pi. The researchers are tapped into the influence of those intuitive taps, swipes, and presses, and applied them in the Smart Bartender plus the used of Raspberry Pi application, a Smart bartender that serves both drinks. The results have shown a high precision when it comes to ratio and proportion. The researchers believe that Smart Bartender benefits the bar owners to be more productive in the field with lesser labor hours and the normal consumers to have great entertainment.

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