

## Enabling user level customization for tea making

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**Abstract**—Tea making machines are devices, which prepare the tea, milk, coffee with demanding flavors. The existing tea brewing machines are only allowing the users to taste the cup of tea or coffee with predefined recipe by the machine maintainers. However, in current context the tea lovers are searching variety of tastes in their tea cup. This paper presents the “Customize tea making system” to enable the user level customization for tea making. This tea brewing machine will address the new concept tea server which means tea machine available on this office room people can login to the tea server and prepare tea according to users’ requirements. The system has been developed as with two main modules such as software and hardware component. The hardware component is deal with “Arduino Uno” to handle tea, coffee, milk and variety ingredients whereas software module provides the connection between system and the user. The software module consists with Web and android application to make the tea request.

**KEYWORDS-** CUSTOMIZE, SENSORS, LOCAL AREA NETWORK

### I.INTRODUCTION

For many people drinking tea is part of their lifestyle. The range of the different tea beverages is broad; in Sri Lanka well known are Light tea, plain tea, Milk tea, coffee and milk coffee. The tea beverages and the consumer preferences of tea drinking habits are various and so are the preparation methods. Among the tea machines with electricity supply, drip-filter tea machines are still widespread in Sri Lanka. But for comfort and quality reasons, the trend clearly goes towards fully automatic machines.

Most current existing brewing machines provide the user coffee with different flavors. If the user need machine which brew the tea and coffee both together it will make too expensive to the consumer to pay for two separate brewing machines since they are in separate machines. Moreover, today the consumers are more knowledgeable

and concern about their health condition according what they take in to their body organs. So the Problem is the existing tea machines would not allow the user to adjust the ingredient quantities in the tea as the user want.

Researchers like Allen Han, Brian Lee and Andreas Rieger, Johannes Huber and Alexander peters have provided the systems Teforia, Teabot and Nescafe Millano respectively some problems are still available in the current brewing machines environment.

This paper presents the solution by allowing the people to test with the various types of tea flavors by their own. This system provides the most appropriate solution to the people who are find the new ways to make their cup of tea so special. The “Customize Tea making system” is control through the android application which is connected to the tea making machine where the user is allow enter the preferable quantities of the ingredients as their choice. The tea making machine is intelligent to identify the user through their mobile phone id and at the next time when user access the machine system can identify the user by their id and previous tastes and provide the options according to the previous feedbacks. Also user can see a preview of cup of tea after they select the quantities as they want whereas if user select more sugar it will show a message that tea is not healthier. Besides the system will give an alarm or a message that the contents of ingredients are less than the required level then user will be noticeable to refill the quantities as needed.

The tea machine and the mobile phone will be communicating through the wireless access point which can be located within the valid range of the network. The communication of the tea machine will use the Wi-Fi technology which formulate user to make their cup of tea be on their position within valid range. This makes the user more convenient with their busy schedule of work. Moreover, users of tea machine will be able to order their special tea from their office, home even in hospitals as they want.

The proposed system is also including the web based solution where the users can access the tea machine through the network and make their special cup of tea. This will be more convenient to the users who are lack of using the android smart phone. The web based solution will be more applicable to the places like offices and other formal public places. The both mobile and web based applications will be having the same features on their own and provide the user to facilities to alternative access ways for tea machine.

In mentioned applications will provide the user profiles and that will keep record whether user has the limitations with the ingredients of tea. Most of the time there are people with issues of the sugar level of their blood and they are very like to having the more sugar with their tea. This intelligent system can be controlled the options of choosing the various flavors for their tea and the applicable sugar to the tea. This takes the major advantage for the diabetic patients in the world to control their sugar level immediately. This service can be served by the machine giving the mobile application to select the category of the user like general, special and etc. Furthermore, users will be providing additional features to find the new recipes of tea and share their own recipes with their friends and further searching about tea varieties.

The tea machine will be introduced the new way of having their tea with their preferable taste and be experience with the latest combinations of ingredients for a simple cup of tea. Finally output of the project will be provide more interested customize tea making machine for the people to make their tea cup so special.

Rest of the paper is structured as follows: Related works, Methodology, design, how system works, perspectives and conclusion with section2, section3, section4 and section5 respectively.

## II.RELATED WORKS

Making a tea machine with preferable taste for the user is more challengeable and demand research topic emerged in recent years. There are some earlier works which aimed at stimulating the making of user preferable cup of tea.

Among the Coffee and Tea brewing machines the Nescafe machines reach the success of brewing tea and Coffee(Roger William Gutwein, Christopher Wade Connor ,2004) automatically with relevant to the user

requests. The variety Nescafe machines are available in the current environment due to the number of canisters as well as the number of options. In the typical brewing machine user will only able to gain a cup of hot milk tea rather than other tea or coffees.

Nescafe Milano (Andreas Rieger, Johannes Huber and Alexander peters, 2011) machine allow the user to brew the coffees their own. This particular machine needs to get the same delicious specialty coffees that coffee-lovers look for in the nearest coffee shop. Through the touch screen of the coffee maker, beverages can be personalized according to everyone’s own individual taste such as espresso, cappuccino or latte. Nescafe Milano can be finding in three different coffee machine sizes like free standing, table top or coffee corner. This Machine use porcelain cups, get hot and cold water directly from the machine and also have it programmed to accept credit cards, personal badges or cash. The coffee maker can be plumbed in or not, as it has a 25-litre water tank that can be filled up from the mains or by hand, which means that consumers are free to place the coffee maker virtually anywhere.

Teforia (Allen Han, 2015) is a personal tea making machine for those who really value their loose leaf brewing experience. It works with any mixture of tea leaves to pull out what it believes to be the optimal flavor in the more than 200 chemical compounds(Q Chen, Z Guo, J Zhao,2008) that make up each kind of tea. Teforia’s device is made for brewing tea at home. It’s networked to a central server to brew various leaves to specific recipes, designed with a bit of theater, on the other; the brewing is as easy as filling the machine with water and dumping in a pre-portioned pod.

With Teforia, the pods even have a RFID tag containing the brew data so that user doesn't need to fuss with buttons. But the consumer can also use own leaves if they're willing to weigh them. It then sets the water temperature to the optimal number, fills a central chamber with water, and stir up the leaves with air. The bubbling effect is beautiful by design, with transparent chambers that allow watching the tea steep.

Machine actually steeps the leaves several times, potentially at different temperatures, to pull out the hundreds of compounds found in tea. It knows the best recipe because Teforia has worked with suppliers to perfect and it bring home user own exotic tea that’s not in the database, a companion iPhone app asks a few simple questions to ascertain what it might be, then attempts its best guess at a brew. App will ask three to four questions,

‘What color is that tea? What shape? What size? Based on the questions (this is what machine learning and big data comes in) it’ll leverage that information and create a recipe for the tea.

Toronto-based TeaBOT (Brian Lee, 2013) is a robot that whips up customized cups of loose leaf tea in less than 30 seconds. The startup launched in 2013 as a way to eliminate long lines at cafes by delivering automated grab-and-go cups of tea. Most tea needs at least 10 minutes to brew, after getting the water to the desired temperature. Each type of tea leaf needs to steep at a certain temperature to get the right flavor and there is quite an art to getting it there. However, TeaBOT works by allowing customers to select from thousands of combinators of tea flavors like the mild chamomile mixed with tangy red rooibos.

The BOT will let the consumer to mix and match different teas or select from some suggested blend on either the TeaBOT Smartphone app or the provided tablet to get a super fast hot brew. User can also pay using the Apple Watch, if he/she wants. Once the selections are made, the TeaBOT uploads the information and pours in a delicious mix of own, unique blend in less than 30 seconds. Special lids with a proprietary filtered mouthpiece keep the tea leaves inside the cup while allowing the hot water some room to cool.

These all research analysis’s hopes to find quick and efficient techniques of brewing tea or coffee, by treating timely to the consumers. Nevertheless, there is no evidence that they have established a brewing tea and coffee in one machine based on the user defined content measures ingredients. When we search for all the related work analytical techniques have been engaged to produce variety of tea or coffee but normally the methods are lack of user preference. To identify the actual requirements a survey has conducted by involving 100 people. So there is a requirement of a model which has the ability to provide the user preferable tea or coffee just using the consumer personal computer or smart phone. We are seeking to develop a brewing machine including most needed types of tea and coffees by allowing changing the ingredients measures as user prefer to fill the gap. This paper shows how existing brewing machines are used to brew the user preferable tea or coffee in systematic manner. In future it is planned to gather the requirements from different users over the country rather than using common data set and

develop tea and coffee brewing machine with high user preference conclusion.

### III.METHODOLOGY

In this research, questioners were used as data gathering technique in order to gather required data for designing the requirement specification for the proposed system. The structured questioner was given to the 100 people and collects their feedbacks to conclude the requirements. The summarized data are shown in the Figure1 as follows.

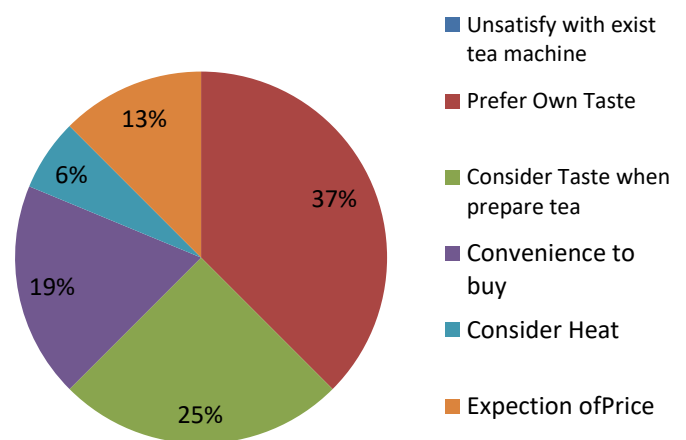


Figure1. Summary of analysed data

According to the gained data set 37% people are aware with the customization the user level for tea making. The other instances show the requirements of tea preparation further. The 25% people consider about the taste very much when they prepare the tea. Finally, the data set brings the conclusion that the 62% are very much eager to have their own tasted cup of tea (T) or coffee(C).

### IV. DESIGN

The Customize tea making system has the concept of tea server, based on the concept the system will be able to provide the user preferable tea for the users. The customize tea making system is mainly consisting with two modules such as hardware Module and software module which explained as follows. According to the above top level design the number of tea/coffee lovers will be interact with the system using their mobile phone or the web application through LAN internet connection and finally gain the tasty user preferable tea/coffee. The mentioned

modules of the system are designed according to the details as follows.

**A. Software Component**

This component is including the mobile application and the web application where both are providing the same features which can control with their own preference requirements. The both applications will be allowing the user to first login to the system and register with the system.

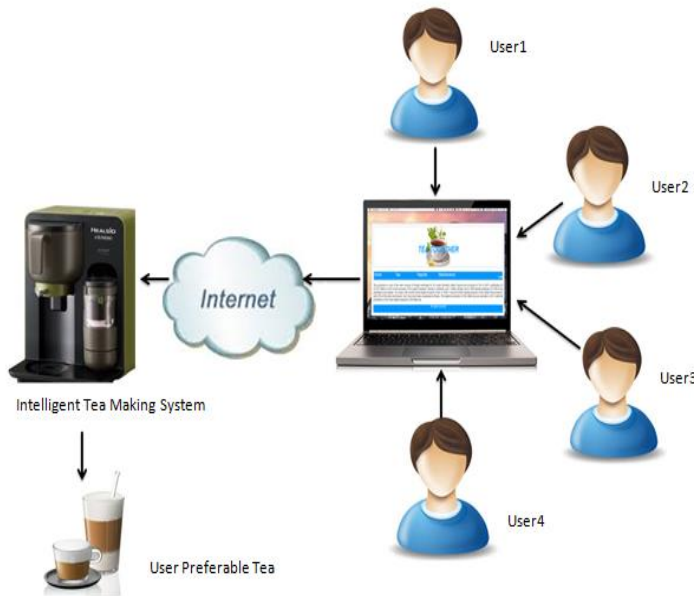


Figure2. Top Level Design of the System

Then he/she will be able to overview about the details of combinations of tea and their respective prices also. The user allows ordering the cup of tea or coffee with their own preference if the user has already registered to the system. The system will allow the user to select the type of tea or coffee from the menu and with related to the type the user will ask to enter the number of spoons in each ingredient. However, the user will get the warning messages when he/she try to input the more and more number of spoons for particular ingredient which depict that it will harm for the health of user. Moreover, user press order button then the required details are fed to the tea making system with communication of local area network. In the view of administrator or maintainer will be notified when the ingredients' are at lowest level in the canisters.

The database module will establish the connection with the mobile and web application. Also the database will be store the all the necessary information of the user and their

usage details of tea machine. This database will be stored in the local server and it will allow the access to the administrator of the system and maintain the credential details of the system. The database information will only link with software or client side application whereas only the tea/ coffee ingredient details are link with the tea making system in order to make user preferable tea.

**B. Hardware Component**

This component is consisting with the physical design or creation of the tea making system. The tea-brewing machine is consisting with the five canisters for the ingredients of sugar, tea, milk, coffee and water. This machine will used the Arduino Uno (WikiPidea) microcontroller as the main controller in addition of those five microcontrollers will connect to the main circuit to control each and every ingredient of the tea machine. The each microcontroller will link to the stepper motor circuits do the mixing and controlling the quantities of the ingredients.

The heater will use to heat the water for a cup. After the required quantities have filtered, the each quantity will control and mixed by their own motors. Finally, the all ingredients will mixed up together in one canister and output the user preferable special cup of tea or coffee to the user. The Figure3 shows the prototype of inside tea machine system.

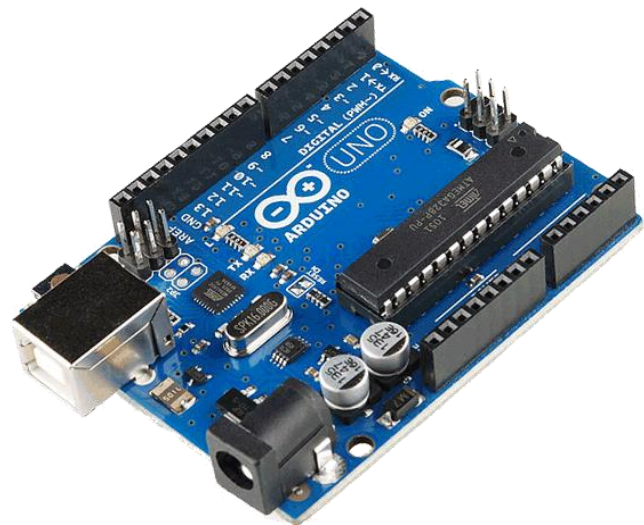


Figure3.The Arduino Uno



Figure4. Microcontroller 16F628A

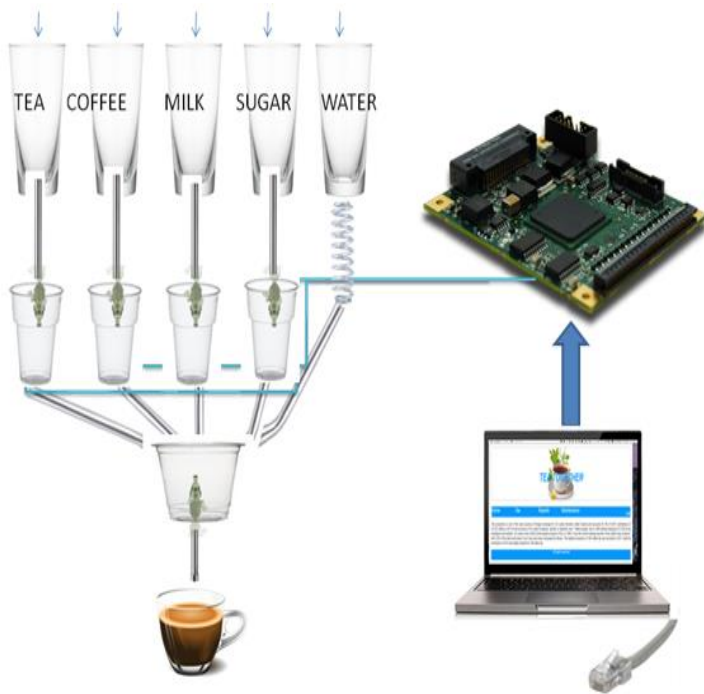


Figure5. Prototype of inside the Tea machine System

### V. HOW SYSTEM WORKS

As mentioned, the customized tea making system is function based on the three function modules such as Software module, Hardware module and the database module. As a user view, the system will function as detailed as follows.

In the developed system user will log to the system using the mobile application or the web application. The web application provides the most places like offices and companies etc. the mobile application can be used by the

personal user to connect to the system. After user registered with the system he/she can browse the features of the application. User will be allowed to check the varieties of tea and coffee of the machine and simply make an order for his/her favorite cup of tea. In the application it asks to enter the relevant quantities of the ingredients of tea or coffee according to the user preference. After input the relevant details user will allow to order their special cup of tea/ coffee immediately.

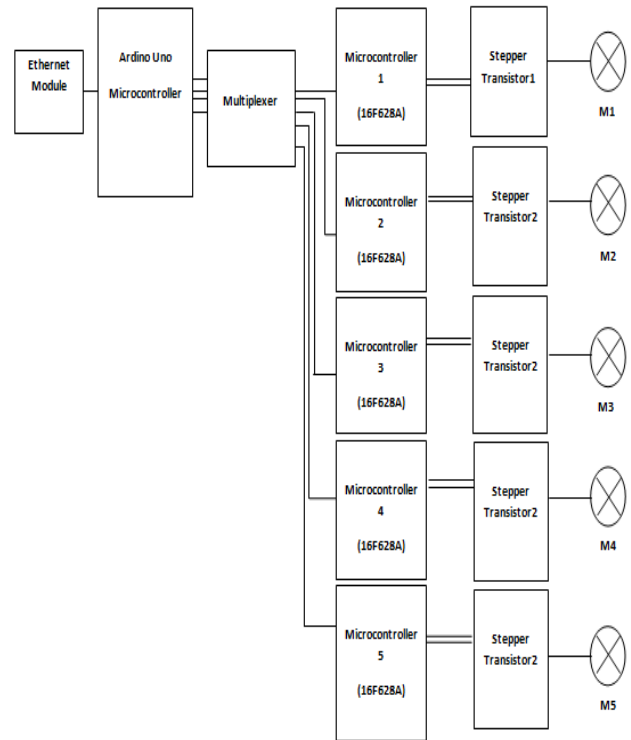


Figure6. Block Diagram of Tea Machine Circuit

Since the system is connected with the Local area network (LAN) connection the required details will input to the customized tea making system. The user Id and other user information and their usages will be store within the database which relied in server of the network. The customized system will only input the required quantities of the ingredients and then process according to the requirement. The machine will control with the programmed microprocessor and will control the quantities by using the pressure sensors. When the requested quantities are input to the respective holders the caps of the canisters will closed and let them to mix by using a small mixture (motor). Water will be heated through the heater within the machine and always water quantity will be defined for a cup.

In the Hardware module the Arduino uno Microcontroller is perform as the main controller and it takes the inputs provided by the user through the Mobile application either web application. The provided inputs will convert to the hexadecimal number and for the purpose use four bits to identify the levels of ingredients. The levels of ingredients are marked as null, low, normal and high. According to the hexadecimal number particular microcontroller will be activate and send the input to the stepper transistor. Furthermore, the each stepper motor will activate with defined time period, for example low level will defined with one-second time period. Finally mixing motor will mixed and provide tasty cup of tea or coffee.

The output of the tea machine will be the tastable user preferable cup of tea/coffee for the user. The end of the week the user will get the bill and report according to their usage of tea machine and ask to pay the respective amount to the relevant authorities.

The administrator and the relevant appointed authorities will do the maintenance of the system. The database management such as delete and update the information of users and system, secure the credential information of the users is form by the administrator. The other maintainers will be able to do the filling of canisters of the system when it gives notification that quantities of ingredients are in lower level. Furthermore, administrator and the relevant portions will be able to do the necessary maintain of the system for well function.

## VI. CONCLUSION and PERSPECTIVES

In this paper introduced the novel framework for tea making process in order to get rid of the busy schedule of their life. The proposed customized tea making system function as an integrated system of mobile and web applications. This system will work according to the user preference ingredients quantities through their mobile phone. This real time system will be suitable for the any environments such as office, restaurant, university etc. To connect with the system user is only required the smart phone and the network facilities around their environment.

As a further work can extend the system and improve it with advanced alerting functionalities. In this respect we hope to enhance the tea making system to many new flavors around the world. And the system to integrate the new feature to pay the bill using various payable methods and allows the user to add new menus to the system

launch their recepies on the web as well as providing feature to share the recepies among their friends. With all the new features we will allow the user to sense the tea making process more interest and efficient. Though hardware and software components are completed, the mechanical instruments for the practice scenario need to be enriched further.

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