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ADULTERATION DETECTION IN MILK USING EMBEDDED SYSTEM

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Abstract: This paper presents the planning and development of the Arduino controller-based system to detect the parameters of milk. The parameters include CLR and SNF. The lactometer is employed to live the number, CLR of the milk. Using the worth of FAT and CLR the worth of SNF are often calculated and studied qualitatively. The sensors are interfaced with the Arduino controller. The software developed enables us to read the parameters and store them in Mongo DB and blockchain DB. Since Blockchain is that the decentralized network is safe and highly secure to store, collect the info. The milk quantity is displayed in litres. This is often a coffee cost and efficient tool to detect adulteration of the milk. Also with the assistance of IoT (Internet of Things) process the milk industry should be ready to send the real-time reading information of milk to the govt in order that it helps to beat the illegal things like milk adulteration with starch, urea during the assembly and processing of milk pocket

Keywords: Milk Adulteration, Detection Techniques, Electrical methods, Health Hazards, Blockchain, Mongo DB, Solid Not Fat,

1. Introduction

Milk is taken into account to be the 'ideal food' because it's having abundant nutrients required for both infants and adults. It supplies bodybuilding proteins, bone-forming minerals, health-giving vitamins, minerals and furnishes energy-giving lactose, milk fat and also supplying certain essential fatty acids. Milk adulteration came into global concern after the breakthrough of melamine contamination in Chinese infant milk products. Unfortunately, milk is being very easily adulterated throughout the planet and significantly worse in developing and underdeveloped countries thanks to the absence of adequate monitoring and lack of proper enforcement. Aside from the moral and economical issues, it also creates health hazards. Most of the days , the adulteration is intentional to form a greater profit, but sometimes it's going to flow from to the shortage of proper awareness. Possible reasons behind it's going to include- demand and provide gap, perishable nature of milk, low purchasing capability of consumers and lack of suitable detection tests. Chemical adulterants are used for various purposes. The common adulterants are sugar, water, salt, starch, chlorine, calcium hydroxide, washing soda, formalin, ammonium sulphate, H2O2, and non-milk proteins, etc. to satisfy the deficit of milk, some people are preparing synthetic milk by mixing urea, sodium hydroxide, refined oil and customary detergents which features a poisonous effect. Hence, the present review highlights the milk adulterants, their detection and their hazards on the health of consumers

1.1 Typical Adulterants and their health hazards on humans

A) Water-Water is that the commonest adulterant added to extend the quantity of milk which successively decreases the nutritive value of milk. But if contaminated water is added to exploit , it's a significant health concern to the milk consuming community.
B) Melamine -Melamine is added to exploit and powdered milk to extend protein content falsely. It causes kidney failure and deaths in extreme cases.
C) Urea -Urea is added to exploit to supply whiteness, increase the consistency of milk, increase non-protein nitrogen content and leveling the contents of solid-not-fat (SNF) as are present in natural milk. Urea is additionally wont to prepare synthetic milk. Health hazards associated are acidity, indigestion, ulcers and cancers. Urea is harmful to the guts, liver especially for kidneys because the kidneyshave to do more work to remove urea from the body. Ammonia in milk develops regression, loss of acquired speech and sensory disturbances. ~ 614 ~ International Journal of Chemical Studies

D) Detergents -Detergents are added to emulsify and dissolve the oil in the water giving a frothy solution, the characteristic white colour of milk. They enhance the cosmetic nature of milk. Detergents cause gastrointestinal complications.

E) Hydrogen peroxide (H2O2) Hydrogen Peroxide is added to milk to prolong its freshness, but peroxides damage the gastrointestinal cells which can lead to gastritis and inflammation of the intestine. H2O2 disturbs the antioxidants in the body disturbing the natural immunity hence increasing aging.

F) Starch -Starch is used to increase solid-not-fat (SNF) and if high amounts of starch are added to milk, this can

cause diarrhea due to the effects of undigested starch in the colon. Its accumulation in the body may prove very fatal for diabetic patients. Apart from the starch, wheat flour, arrowroot, rice flours are also added

2. Milk Samples

Here different milk samples are taken as the source which includes fresh milk & adulterated milk.

2.1 Fresh milk: Initially the fresh milk of about 80ml is taken in the glass as a sample which has the pH range from6.5-6.8, temperature range from30-35deg C, and also will have a good odor. All the sensors in the senor block are dipped in the fresh milk sample and the corresponding test is performed.

Fresh Milk Sample-1 is the fresh milk that has standard pH. After the fresh milk test the standard parameter value will be displayed on the LCD screen.

Table 1. Fresh Milk

Sr.no	pH	Air quality	Conductivity	Urea
1.	164	232	368	0%
2.	151	205	383	0%

2.2) Adulterated milk Here four sorts of adulterated milk sample are taken which may be the mixture of sugar,50ml of water and 50ml of milk or pinch of salt,50ml water, and 50ml milk or 4/5tbs of soap,50ml of water and 50ml of milk or 2tbs of H2O2,40ml of water and 40ml of milk. For each adulterated sample the sensors are dipped in adulterated milk, the sensors will detect the changes from the values of pH and this change in parameter values will be passed to the microprocessor for further calibration.

3. Electrical Methods to Detect Milk Adulterants

In these section different electrical methods are conducted to detect milk, and hence the adulteration is summarized. Electrical methods are comparatively simpler than other methods and easy to process as the signal is in the electrical domain. he other advantages are using block chain is the data is secured and tampering is not at all possible and the data are decentralized.

1. pH Sensor:pH (potential of hydrogen) is employed to live of the proton concentration in water. The pH always ranges from 0 to 14. Solutions with a pH of but 7 are acidic and solutions with pH greater than 7 are basic and solutions with pH at 7 are neutral. Every liquid has its pH value consistent with temperature and other dependent parameters. therefore the milk features a pH range from 6.5-6.7, above and below of this range milk considered as abnormalities in its quality. Here pH is monitored employing a pH sensor. pH electrodes are glass electrodes. pH sensor is formed of a glass ended with alittle glass bubble. Inside the electrode is typically crammed with the buffered solution of chloride during which silver wire covered with chloride is immersed.

2. Conductance Measurement The conductance method between two electrodes may be a technique to detect adulteration in milk. Most of the times the electrical equivalent model of the electrodes immersed within the sample and evaluated to identify the adulterated milk.

3. Ultrasonic Detectors Many brands of milk contain chemical additives such as sodium carbonate (Na2CO3), sodium bicarbonate (NaHCO3), formalin (HCHO), etc. These chemicals are added to milk to preserve it for a longer time or as a neutralizer to prevent curdling has reported the study of thermos acoustic analysis to identify the chemicals.23 In this method, the density and ultrasonic velocity are determined for different samples while the temperature is kept fixed for a particular measurement. Ultrasonic velocities were measured by a single crystal ultrasonic interferometer at a frequency of 2 MHz.

4. Methodology

1. Survey Method

The local milk transport was chosen via a random sampling method. 10 samples data from various milk van transporter were collected in a blockchain Database via GSM Module and send the alert to the laboratory authority after the detection of adulterants present in milk and its products.

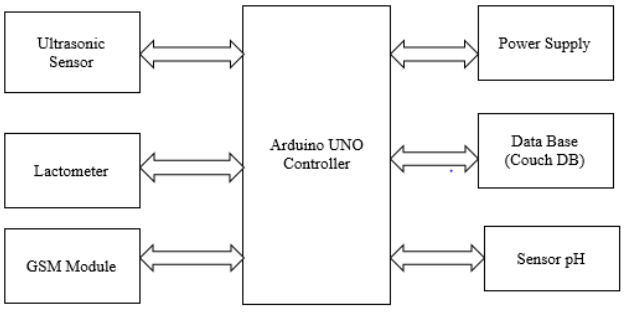


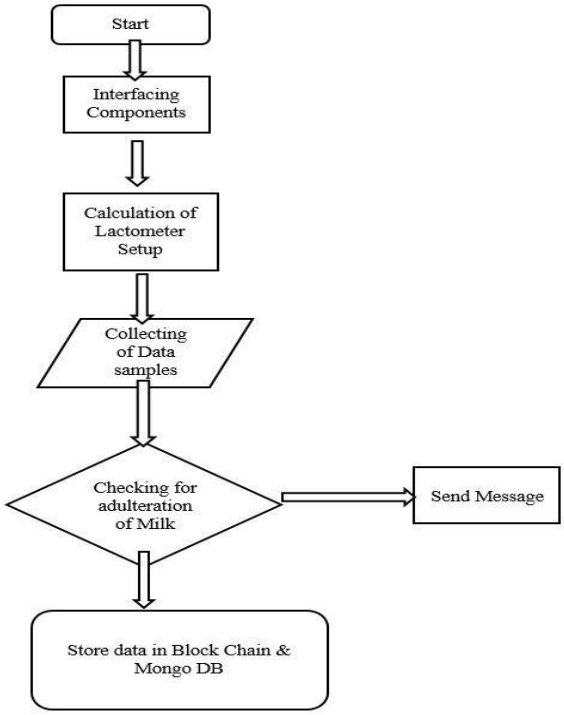
Fig.1 Interfacing of sensors

2. Study Design: Random Sampling Design

3. Test: 3 adulteration tests were conducted to detect common adulterants in milk and milk product samples

collected from various areas in and around the campus of Osmania University College for women, Madhavaram Chennai the tests conducted are as follows:
1) Water test: to understand the share of water added within the milk, as water is that the commonest adulterant added within the milk.
2) Fat test: To know if urea is added in the milk to increase its SNF value.
3) Starch test: to understand the quantity of starch added within the milk and milk product samples.

4. Flow Chart



5. Block chain

In simple words, block chain may be a network of computers. Computer owners are the building blocks of this network. The network is designed to carry out operations whose data is stored forever on the Internet and cannot be changed or tampered with. Currently, most people use a trusted intermediary such as a bank to make a transaction. But block chain allows consumers and suppliers to attach directly, eliminating the necessity for a 3rd party. Using cryptography to secure exchanges, block chain provides a decentralized database or "digital Ledger" of transactions that can be seen by everyone on the network. Technology can work for nearly all kinds of value-related transactions, including money, goods and property. Its potential is nearly limitless: from financial transactions, bypassing banks, to internal control of products and medicines sold round the world The food chain is indeed very complex. There are many manufacturers, packers, transport operators, consultants, agents, temporary workers, traders involved within the production, storage and logistics of food products. They are only a very small part of the food industry. Such a decentralized process requires a decentralized solution. Blockchain within the food industry simplifies the complex task of collecting and transmitting information from a spread of subjects, ensuring data interconnection and coordination of processes between participants.

5.1 Block chain in food safety

Retail giant Walmart, Chinese e-commerce company JD.com, World leader in blockchain technology multinational company IBM to launch the Blockchain Food Safety Alliance. The organizations have created a blockchain aimed toward improving food safety and traceability within the food industry and achieving greater transparency within the entire food supply chain. This innovative method of collecting data on the origin, safety, and authenticity of food products uses blockchain technology to supply real-time traceability throughout the availability chain. Blockchain technology promotes encrypted and immutable accountability and provides suppliers, regulators, and consumers more insight and transparency into how food is handled, on the way from farms to consumers. Previously, such information was difficult to seek out and disseminate due to complex and disparate data exchange systems. Most of them were created on paper, and even where they were digitized, the info didn't always meet high standards.

The integration of blockchain with the web of Things (IoT) for real-time monitoring of physical data and tracing supported the hazard analysis and important control points system (HACCP) has recently been proposed. this is often particularly critical for the upkeep of the cold chain within the distribution logistics of spoilable food products.

6. Result and Discussion

a. The quantity measurement was found to be accurate and precise within required result variation. However, the system is vulnerable to the position of the sensor and therefore the shape of the container. Hence more perfect setup is required to urge an accurate measurement.

b. The CLR measurement was found to be accurate and precise within the range of sample values. However, it had been also vulnerable to any small variation within the sample. Hence a more suitable found out would be needed to urge the accurate readings.

c. The pH measurement is found to be accurate and precise within the range. However, it had been also vulnerable to a moment variation within the sample. Hence the sample must be consistent in its composition to urge an accurate reading. this will be achieved by stirring or homogenizing the sample with a stirrer. A more suitable setup would be needed to boost the accuracy of the system. Provision to wash the sensor employing a solution for each sample may be a must.

Fig 3. Couch Data Base with the Sensor Reading and Water content.

7. Conclusion

The development and application of efficient milk adulteration detection and analyzing system using the Arduino microprocesssor have been presented in this paper. The system allows the measurement of volume and other parameters such as pH, CLR and SNF. The system is simple and ease to use; it works with low power consumption and has a fast response. Thus it can be implemented for portable applications. Future work will be focused on improving the overall accuracy of the system. Also, efforts could be made to make the system handier (design miniaturization) so that it could be freely implemented in field operations Summing up, blockchain is a promising technology towards a transparent supply chain of food, but many barriers and challenges still exist, which hinder its wider popularity among farmers and food supply systems. The near future will show if and how these challenges could be addressed by governmental and private efforts, in order to establish blockchain technology as 27 a secure, reliable and transparent way to ensure food safety and integrity. It is very interesting to see how blockchain will be combined with other emerging technologies (big data, robotics, IoT, RFID, NFC, hyperspectral imaging, etc.), towards higher automation of the food supply processes, enhanced with full transparency and traceability. And integrity. It is very interest to see how blockchain will be combined with other emerging technologies (big data, robotics, IoT, RFID, NFC, hyperspectral imaging etc.), towards higher automation of the food supply processes, enhanced with full transparency and traceability.

REFERENCES

[1] Sooraj Shah Blockchain Food Safety Alliance launched to tackle supply chain issues, Internet of Bussiness, December 15, 2017, Retrived from https://internetofbusiness.com/blockchain-food-safety-alliance

[2] Lin, Y. P., J. R. Petway, J. Anthony, H. Mukhtar, S. W. Liao, C. F. Chou, and Y. F. Ho. 2017. "Blockchain: The Evolutionary Next Step for ICT E-Agriculture." Environments 4 (3): 50

[3]Poberezhna, A. 2018. "Addressing Water Sustainability WithBlockchain Technology and Green Finance." Transforming Climate Finance and Green Investment with Blockchains. Academic Press. 189-196

[4]Tripoli, M, and J. Schmidhuber. 2018. "Emerging Opportunities for the Application of Blockchain in the Agri-food Industry." FAO and ICTSD: Rome and Geneva Licence: CC BY-NC-SA 3 .

[5]Tse, D., B. Zhang, Y. Yang, C. Cheng, and H. Mu. 2017. "Blockchain application in food supply information security." International Conference on Industrial Engineering and Engineering Management (IEEM). IEEE. 1357-1361.