**Proposal**

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| Title | Spoiled beverage detector |
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Introduction and Problem Statement

Often, we hear children getting sick from consuming expired drinks. This can be due to the fact that children are not fully aware of the early signs of expired drinks. Although this could be more prevalent in children, adults come across such problems as well. As a result of food poisoning, they experience a variety of problems such as stomach cramp, fever, vomiting, nausea and diarrhea. In order to avoid such problems, children should be educated on how to consume drinks diligently. This could be different for any beverages. In the case of juice, except the expiring date, taste and smell, there is no other way to discriminate a spoiled one. This situation is even worse for homemade juice. Also, people have problem with milk. In order to find out if the milk is gone bad, boiling is an option which takes time and consumes energy. Moreover, some prefer to have cold milk, so even after boiling the milk they have to wait for cooling down. Finally, some people do not trust the expiration date and throw out the drink which is a wasting of food.

With new advancements in technology, a device such as a smart cup should be developed in order to detect expired drinks and display the results fast. With this, not only a multitude of problems associated with drinking expired beverages can be avoided, but also it can prevent discarding of the drinks that were presumed to be expired.

Objectives of the Design

We live in an era that time and energy are two valuable sources. Thus, any engineer or designer should take these factors into account to build a device which responds fast and uses least amount of energy. On the other hand, people tend to use more portable devices because such devices give more degrees of freedom to users. Consequently, a suitable approach to solve this problem could be a smart cup or even a smart stick which is designed based on the mentioned parameters. Last but not least, this design must be environmentally friendly.

State of the art technologies

Recently, few similar products have been developed which will be described in a concise manner below. UC Berkeley's smart cap was designed in 2015 by a group of researchers at UC Berkeley and Taiwan's National Chio Tung University to detect spoiled milk. Using a 3-D printing method, the electrical components of the sensor were created. The second device which is called “Vessyl” was developed by Justin Lee in 2014. It helps people to make healthier decisions by informing them about the nutritious value of their drinks. Finally, “Ember” which was introduced in 2010 is a ceramic mug that acts as a thermostat and keeps the temperature of the hot drinks in the desired range.

Design Steps

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| Background Research | Biochemistry of mutual characteristics of different spoiled drinks |
| Review of related technologies |
| Technology | Searching for useful sensors |
| Finding suitable material for device |
| Designing the electronics |
| Realization | Develop a virtual prototype |
| 3D structure of final design |
| Final evaluation | Assessment of the pros and cons, cost estimation |