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TIT-BIT

Client: David Whitaker
Advisor: Dr. Pandey Santosh

Introduction

Project Statement:

Our client David Whitaker and his wife came out with the idea from their own experience of being parents. One day Ann was breastfeeding and wondered of how much milk their baby had consumed. After doing some research, they found out it's a common issue with mothers who breastfeed.

Current Solution:

Madela Inc. currently manufactures breast feeding pumps for mothers to pump milk. Mobile applications that allows mothers to manually enter the quantity of milk consumed.

Our Solution:

Tit-Bit is a device to complement the breastfeeding experience of a mother. Mothers currently don't know the exact quantity of milk their babies drink when breastfeeding. Our product, Titbit, is a revolutionary breast milk flow meter that helps mothers track the volume of milk they feed their babies in real time. Along with the breast flow meter, we are also building a mobile app that receives data sent from the device and displays the volume of milk to the mother in real time.

Functional Requirements:

Overall Project:

- The product shall measure flow of milk and display data into a mobile platform.

Hardware:

- The device shall detect flow of milk
- The device shall communicate with Bluetooth
- The device shall measure flow of milk real time
- The device shall be battery powered

Software:

- The application shall receive data over Bluetooth
- The application shall display incoming data representing amount of milk consumed in milliliters.
- The application should indicate how full the baby is getting into a progress bar.
- The application shall be Facebook compatible The application shall have user view data real time

Non Functional Requirements:

Overall Project:

- The system shall measure flow of milk within 0.10 margin.

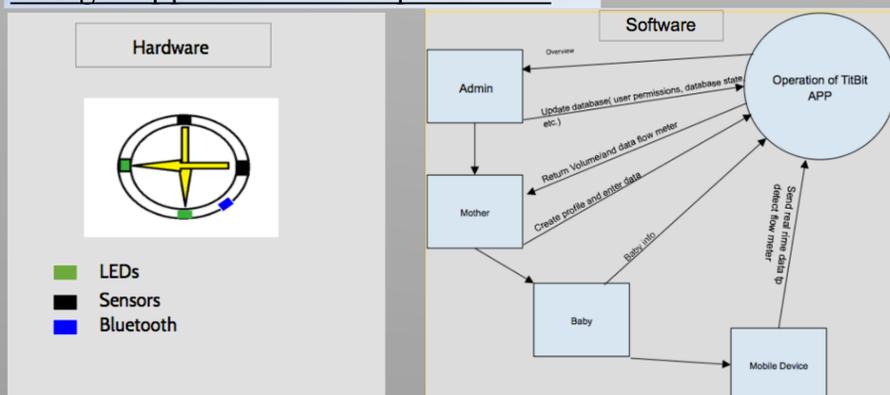
Hardware:

- The device shall be small
- The device shall be hazard free
- The device shall be rechargeable
- The device shall not have more than two buttons.
- The device shall be easy to setup and use.

Software:

- The mobile application shall be easy to use. A user should understand the application quickly.
- The applications displays features in an organized manner
- The application shall display accurate results.

Design Approach - Concept Sketch:



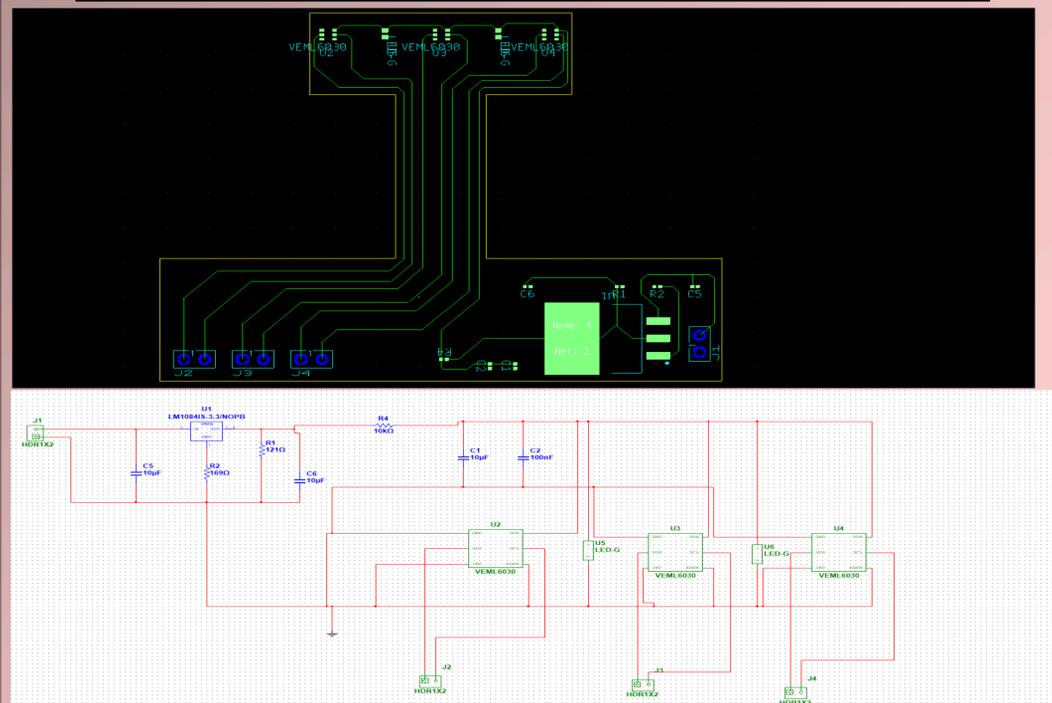
The hardware is composed of two

LEDs, two sensors and one Bluetooth. The sensors read the light intensity from the milk. That data is picked up via Arduino Bluetooth and sent to the mobile application. The LEDs are used as states indicators.

Modules

The software consists of reading the data sent from the hardware and compute it. The computation consist of a conversion of a byte array and some data analytics. The amount of milked consumed so far is displayed real time into the application in milliliters. It also displays a progress bar to indicate how full the baby is getting.

Technical Details – Electronic Modules:



The electronic module is composed of three sensors, two LEDs, a Bluetooth module, resistors, capacitors, a 3V regulator, and a 3.7 Lithium-Ion battery.. Each sensor detects light intensity individually. If for some reasons one sensor has complications to do the work then the second sensor reads the value. The values are sent through a Bluetooth transmitter. The sensors and LEDs are powered by 3V.

Hardware platform

- Arduino
- Bluetooth
- Samsung Android

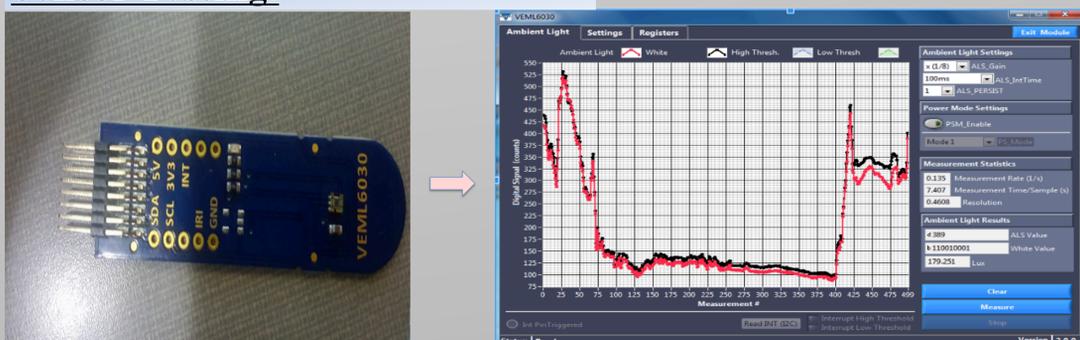
Programming Languages

- Java for android
- C and C++

APIs :

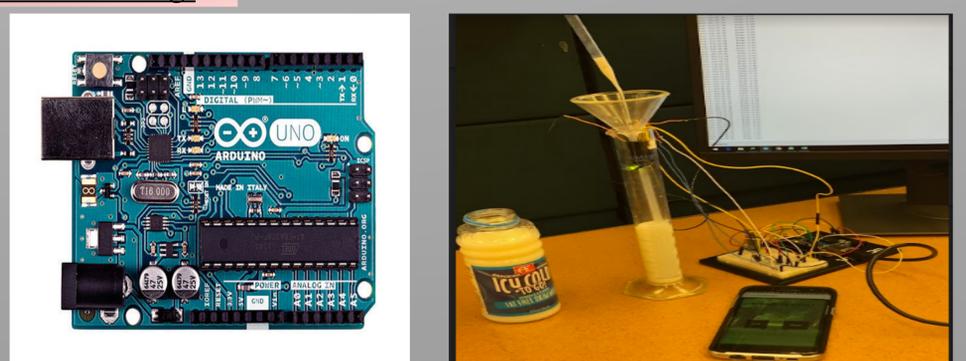
- Android.bluetooth
- Arduino BT

Sensor Testing:



The test of the sensors consists of using the VEML6030 Demo Board. It's equipped with ambient light sensor software. The sensor is equipped with a analog to digital converter that is able to display a 16-bit value. This value is described as the Ambient Light Sensor (ALS) Value that is determined by the measurement of lux, the measurement of one lumen per square meter. These 16-bit binary values are used to determine the rate of flow in our software, where: 0000000000000000 corresponds to the no light and 1111111111111111 corresponds to the brightest setting. The current equation milk flow is $Flow\ Rate = -2.111 * \log(light\ intensity) + 11.537$ Light intensity is detected by the sensors.

System Testing:



Testing for this design consist of pouring milk into a funnel where a lit LED and sensor board are placed on opposite ends of this funnel. The milk that flows through disrupts the light signal and changes the ALS(Absolute Light Sensor) value. The host microcontroller, that being the Arduino, is able to receive this digital value and display it on screen, real time. The host microcontroller is also able to manipulate these values so that when a certain value is received for a certain amount of time, it is read as a rate of flow. The Arduino Bluetooth module is then able to send these values to the mobile application which then display the rate of flow in real time.