Physical Design Proposal
Team #7

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Activity Report

1 Proposed Solution

Our solution to improve the system consists of adding an LCD screen which will display instructions and data to the user. In addition, since the distance from the sensor is calculated through the speed of sound in the air which is affected by temperature and humidity, we will implement a temperature / humidity sensor. This will increase accuracy as it will give us the current temperature and humidity so we can use that to better calibrate our distance sensor readings. In addition, we can prevent the system from breaking with warnings such as green led when the user has not exceeded 75 percent of maximum load and red led and buzzer sound to go off to alert the user to stop pulling. Lastly, we will upgrade some of the components throughout the system including the pulley system, rope, clamps and overall stability of the physical structure.

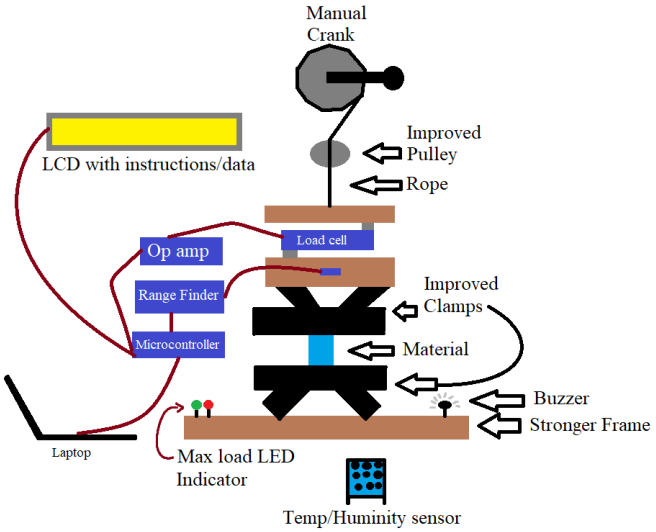

Figure 1. Current state of the tensiometer physical design. You may wish to use letters which can identify components in more detail in the accompanying text description.

2 System Architecture

We added a Humidity/Temperature sensor that will be used to calibrate and get a more accurate reading of the ultra range sensor. This is done by reading the current temperature and humidity of the room and multiplying the constant to turn into speed of sound and add it to get an accurate speed of the current range sensor. We then have an LCD screen that currently displays the current range and weight of both sensors after going through instructions on how to setup the system to the user with a button to go to the next step and start the test. There is also leds that indicate if the current load is within the load cell and if it goes over 5kg the red light will be on and the buzzer will go off to indicate caution of possibly breaking the load cell.

With our LCD screen we have an I2C board

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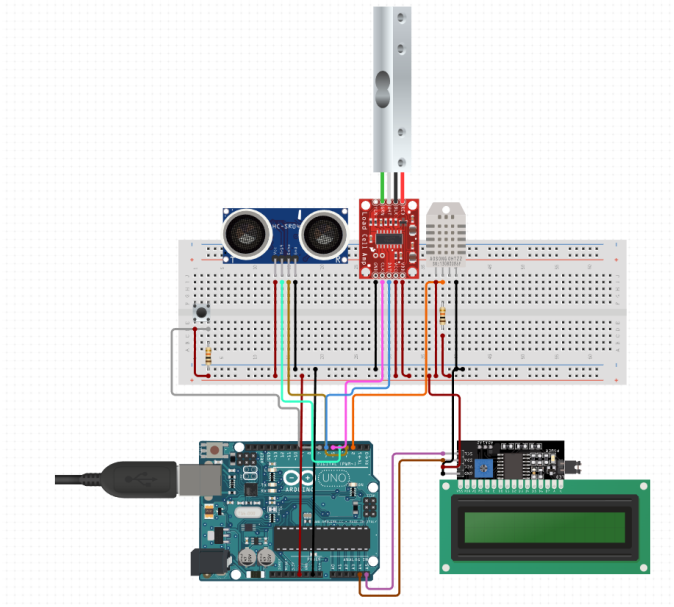

Figure 2. Schematic diagram of tensiometer electronics.

connection to have a simplify down to 2 data pin connections to make the bread board and leave open connections on the arduino for other connections. With the LCD screen we have a potentiometer in order to control the contrast and brightness of the screen for the user to change accordingly. The temperature and humidity sensor uses a single digital data pin on the arduino board.

2.1 System Components

Components added to our system includes a LCD screen for instructions on how to run the system as well as displaying current data being read, a humidity and temperature sensor to help calibrate the ultra range sensor. There is a potentiometer to adjust the contrast on the LCD screen as well as the calibration for the load cell. We added a pulley to smooth out the pulling process as well as a Kevlar rope to be stronger and appropriately hold the components needed for the pulling process. There also is a button in order to continue through each step displaying on the LCD screen as well as starting the data gathering process.

2.1.1 Temperature / Humidity Sensor

The distance sensor calculates distance through the speed of sound in the air which is affected by temperature and humidity. This will give us the temperature and humidity value so we can better calibrate our distance.

Item	Part #	Cost
Temperature / Humidity Sensor	3-01-0039-A	$10.29
LCD screen with I2C module	1602	$10.99
Single Pulley Block	Creatiee	$14.99
Kevlar Cord	N/A	$9.99
TOTAL		**$46.26**

Table 1
Provide an overview of any new parts that need to be purchased and their estimated cost. Each team is responsible to order their own parts.

2.1.2 LCD Screen with I2C module

This will allow us to display information such as instructions or data to the user. I2C connection simplifies our LCD screen connections to 2 pins

2.1.3 Single Pulley Block

Make the pulley system smooth

2.1.4 Kevlar Cord

Thinner and stronger rope to make pulley system smooth.

2.2 Engineering Standards

2.2.1 I2C Protocol

I2C simplifies our Load Cell and Range Finder to only two connections.

2.2.2 UART Protocol

UART communicates data detected by the sensors to serial data for our arduino software on laptop.

2.2.3 Data Standards

CSV file standard allows us to represent a matrix of numbers / text. We will be using this to help the user collect data.

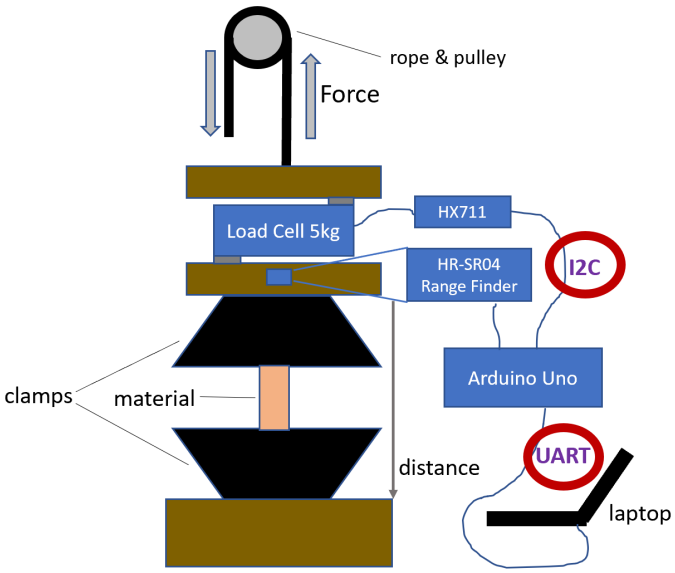

Figure 3. The current tensiometer system implements two communication standards (protocol) I2C and UART.