Luxmeter | Project Proposal

This project will be focusing on implementing a Luxmeter microcontroller, a device for measuring general light intensity in the environment.

Project Implementation

In order to do so, a photo-cell resistor will be utilized to measure the light. Below is a general diagram of the expected overall block diagram of the project construction. Note that this is an initial diagram and the end-product may differ quite a bit – the diagram will evolve over time to specify the actual implementation.

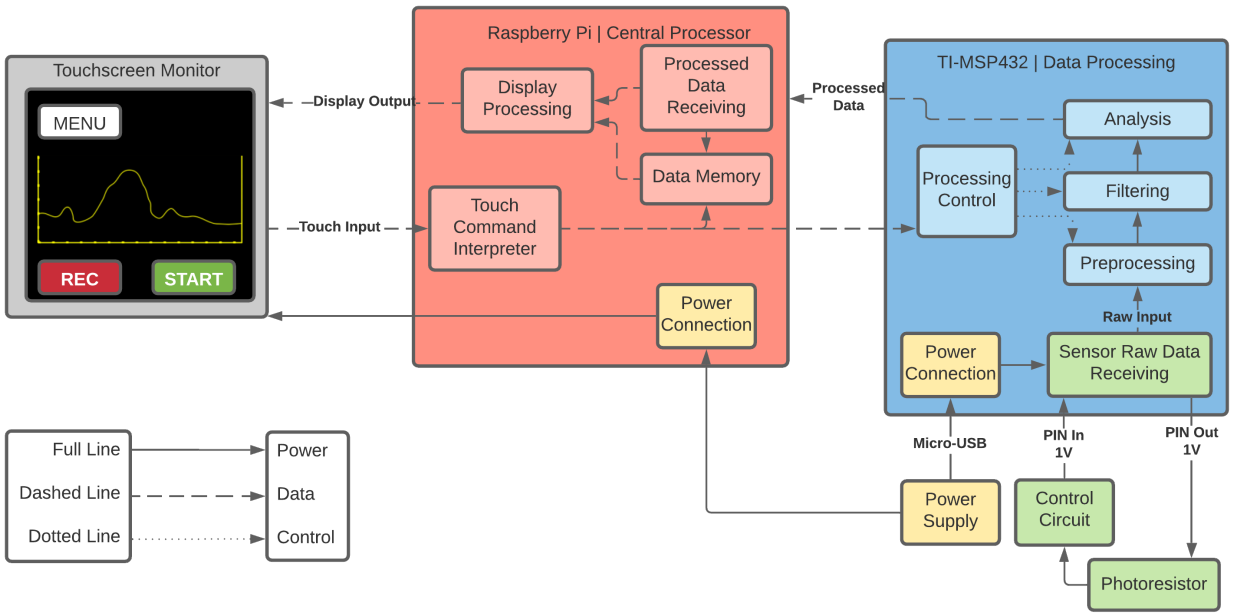
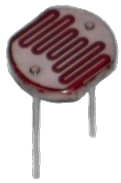
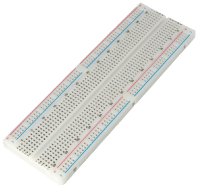


Figure 1: Top-Level Block Diagram showing the basic interfacing between the major components.

Note to Yildirim: I am somewhat confused on the role of the TI board. I understand that it will be used for the connection of the analog sensor, and initially I though it would process the data to some extent. However, I am a bit confused on where the actual interpretation of the data will take place – in the Pi or TI board. I suppose I will find out as I delve further into the project.

Hardware

A preliminary investigation (and a certain PDF document) reveals the necessity for the following components:

Image	Hardware	Role
	Light-Dependent Resistor (LDR) [1] [2] [3]	The main sensor for the system; a resistor that changes its resistance based on intensity of light upon it.
	RaspberryPi 4 (RBPi) [4]	Central Embedded Processor and Display Control
	Adafruit TFT Touchscreen (LCD) [5]	Display and Interface Control. Acts as the primary interface between user and system (both out and input).
	RBPi Casing	Protect the Pi
	RBPi AC/DC Adapter	Power the Pi
	TI-MSP432 (TI) [6]	Analog Data Processing; connects to the sensor directly and conveys data to RBPi.
	Secondary AC/DC Adapter	Power the Ti
	Resistor	Likely needed in series with LDR to provide a minimum threshold of resistance.
	Wiring	Needed for connecting LDR.
	Breadboard	Allow easier testing; likely replaced by soldering or twist connections later.

Software

Software	Role
C++	Programming Language
Launchpad/Sketch	
Energia	

Deliverables

- Working Example Sensor-System Setup
  - MUST Measure Light Intensity upon Sensor
  - MUST Process and Filter Raw Data
  - MUST Display Light Intensity Graphically
  - MUST Record and Log Data to Storage
  - MUST Detect Short, Bad, or Missing Sensors
  - SHOULD Allow External Connections/Readings
- Hardware Wiring Diagrams
- Flowchart for Programming Process
- Flowchart for GUI Functions
  - Display the results in Lux, Candela, and Lumen.
  - Automatic switch graph axis according to unit/format selection.
  - Provide menu option for measurement unit selection for Lux, Candela, and Lumen.
  - Provide menu option for unit calibration.
  - Provide menu option for recording (RECORD/START/STOP).
  - Provide menu option for x (time) and y-axis (Lux, Candela, and Lumen) range.
  - Plot the result in a simple chart current light intensity vs. time.
- Lab Instruction Guide

References

1. ada lady (2018) Photocells, Adafruit Learning System.
2. CdS photoconductive photocells: PDV-P8001 (2006) API: Advanced Photonix, Inc.
3. Photocells: Epoxy encapsulated series Perkin Elmer.

4. Foundation RP (n.d.) Raspberry pi hardware, n.d. Available from: https://www.raspberrypi.org/documentation/hardware/raspberrypi/README.md.
5. ada lady (2020) Adafruit PiTFT - 2.8" touchscreen display for raspberry pi, Adafruit Learning System.
6. Instruments T (n.d.) SimpleLink MSP432P401R high-precision ADC LaunchPad development kit, n.d. Available from: https://www.ti.com/tool/MSP-EXP432P401R.