

8TH MAY 2024

Simple Pendulum

Team Name: Irritated of Things

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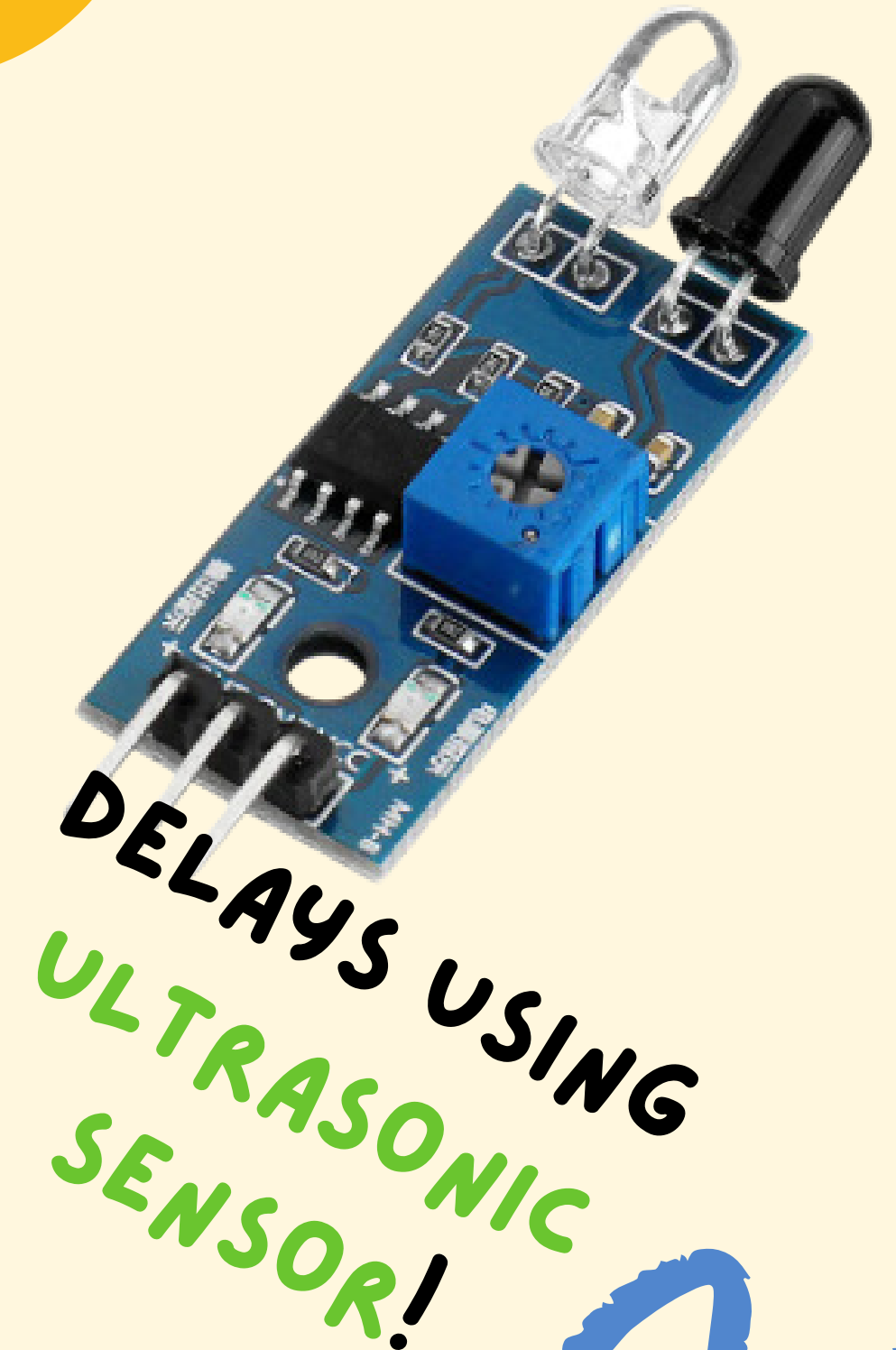
Aims and Objectives

- Calculating and verifying the value of acceleration due to gravity.
- Observing the effect of changing the length of the simple pendulum on the time period

Implementation

Sensing - Infrared Sensor

- For sensing/ measuring the time period of the bob, we have used an IR sensor fixed to the rod of the pendulum, which detects the bob every time it is at the mean position.
- Between 2 consecutive detections, we get the time of half oscillation, that is $T/2$, using which we can calculate the time period of the bob.



Implementation

Variable length - Pulley mechanism

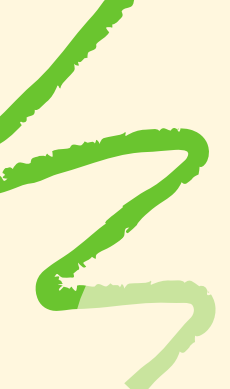
- For implementing a system that can be used to vary the length of the simple pendulum, multiple things had to be kept in mind, such as:
 - a. Moving the bob up or down would also require moving the IR sensor and actuator as these things are calibrated for a particular length.
- We hence move the point of suspension up or down, resulting in change of the effective length of oscillations.
- For this, we have implemented a mechanism similar to a pulley, which pulls up or down, the point of suspension using a MG995 motor



The Dashboard: BlynkIoT

The dashboard has been implemented using BlynkIoT
BlynkIoT is user-friendly, easy to implement and understand






**We first create a 'Device' on Blynk.
Each device has it's own name,
authentication token, author and data
streams.**



More on Blynk

**Data streams are channels that are used to send data between the
device and Blynk Cloud.**

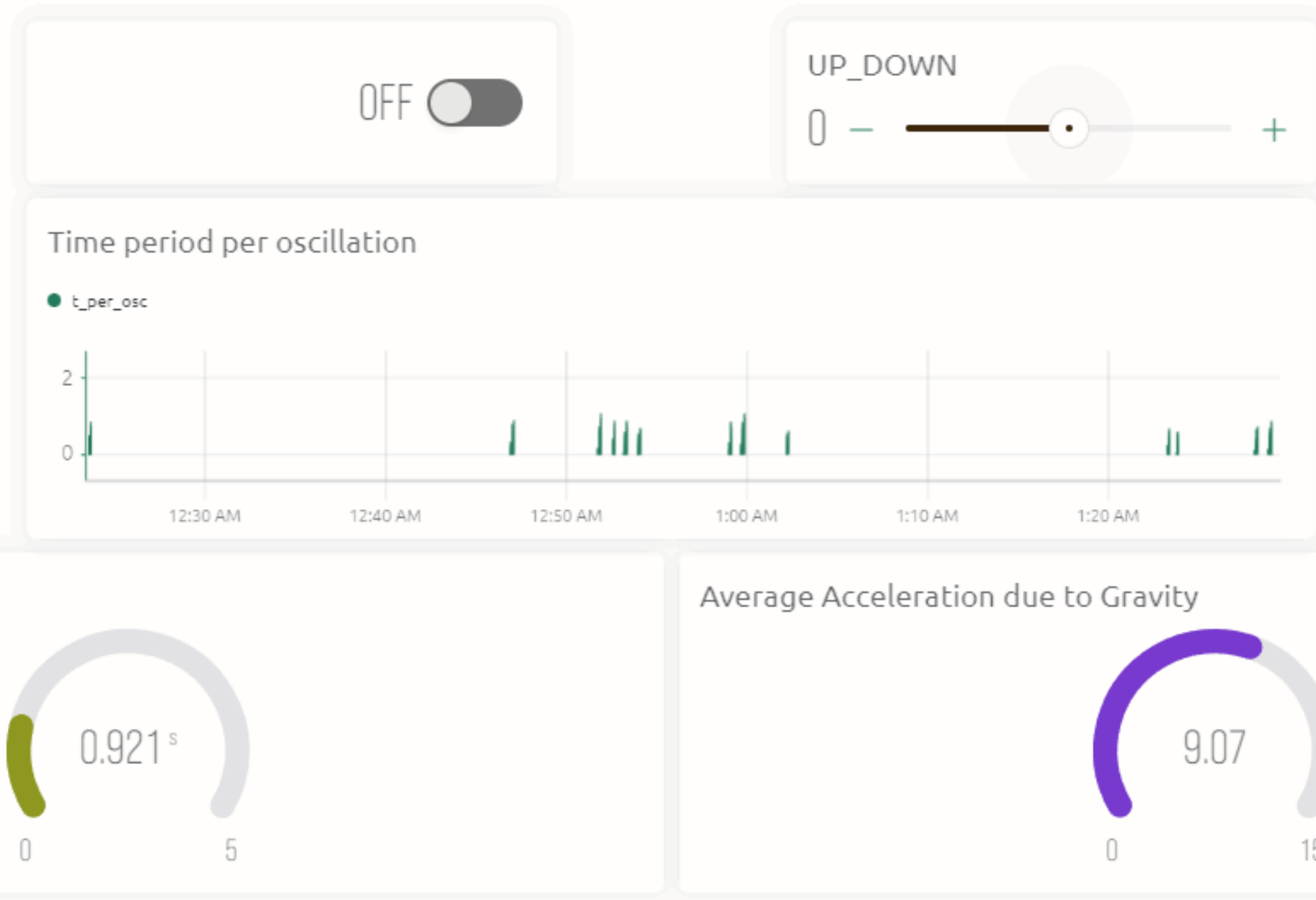
**We will be using the Data streams to actuate the set-up, change the
length and display the value of acceleration and time period**



THE DASHBOARD

WIDGETS

WIDGETS





Problems Faced Hardware

- Figuring out actuation was a difficult task, as each method had its own problem. Even in our method, calibrating the correct length for actuation took some time.
- Calibration of the IR sensor needs to be done when the surrounding environment is changed, as it works on the **principle of the intensity of the received light rays**.
- Implementing the variable length mechanism was the toughest part, as we faced issues like, **insufficient tension**, **breaking of string**, the movement of the point of suspension in two dimensions, **damping of the oscillations**, prominent for smaller lengths which affected the motion of the bob.



Problems Faced Software

- **Arduino IDE:** Port detection, Uploading code was difficult.
- **ThingSpeak:** Data can be sent only once in 15 seconds.
- **BlynkIoT:** No more than 5 widgets can be displayed on the dashboard in the free version (in the desktop version), 4 on the mobile app.