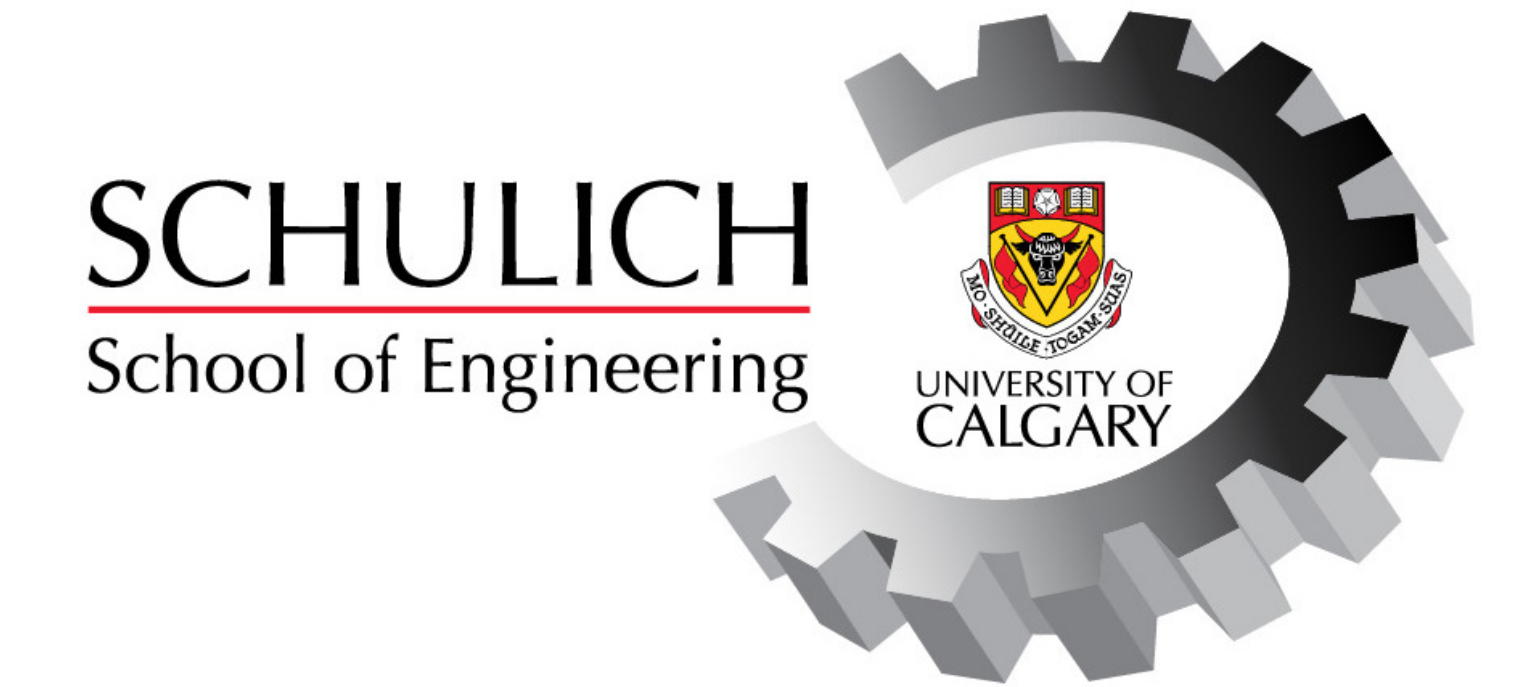


# Virtual Reality Accessory Solutions

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## Abstract

- Vision impairment can be preventable with early screening; however, this is not always accessible [1].
- Preventative screening exams can be administered on a virtual reality headset for increased portability [2].
- Current trial lens frames on the market are too bulky to fit under a virtual reality headset.
- Virtual reality controllers are designed for gaming and are overly-complex for the purpose of an eye exam.
- This project focuses on developing accessories for a virtual reality headset: a trial lens frame and a controller.
- The trial lens frame was designed, and 3D printed.
- Firmware was developed, a power management system was designed, and a casing was 3D printed for the controller.

## Results

- Prototype trial lens frame:
  - It can be comfortably worn under the headset.
  - The interpupillary distance can be easily adjusted.
  - It is designed to allow for easy insertion and removal of the trial lenses from the frame.
  - It is inserted and secured inside the headset with a compression fit.
- Prototype controller:
  - It is ergonomically designed for comfortable grip, simplicity, and ease of use.
  - It can successfully advertise itself, pair with a device, and transmit Bluetooth signals.
  - It is economical with a rechargeable battery.

## Future Work

- Additional work is still required to get the accessories ready for commercial use at eye clinics.
- Both accessories require molds for scaled-up manufacturing with the chosen materials.
- Both accessories require user testing with patients to be done by RetinaLogik Inc.
- The manufacturing materials must be use tested for durability.
- An application for pairing the controller to the headset and eye exam software is to be developed by RetinaLogik Inc.

## References

1. "Blindness and Vision Impairment," World Health Organization, <https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment> (accessed Dec. 4, 2023).
2. M. Mina, "Project Proposal Form," University of Calgary, Calgary, Alberta, 2023.

## Introduction

- At least 2.2 billion people around the world live with visual impairment and almost half of these cases could have been prevented with early screening [1].
- RetinaLogik Inc., the project sponsor, is a Calgary based company that aims to make vision screening more accessible by administering eye exams on an off-the-shelf virtual reality headset [2].
- RetinaLogik Inc. has requested the development of accessories to improve the patient experience when administrating visual screening exams:
  1. Trial Lens Frame: to be worn under the headset when doing an exam. It should allow for easy exchange of different prescription lenses and easy adjustment of interpupillary distances (IPD).
  2. Controller: to be used as a means of interacting with the exam. It should pair to the headset via Bluetooth, be ergonomic, and be easy to use.

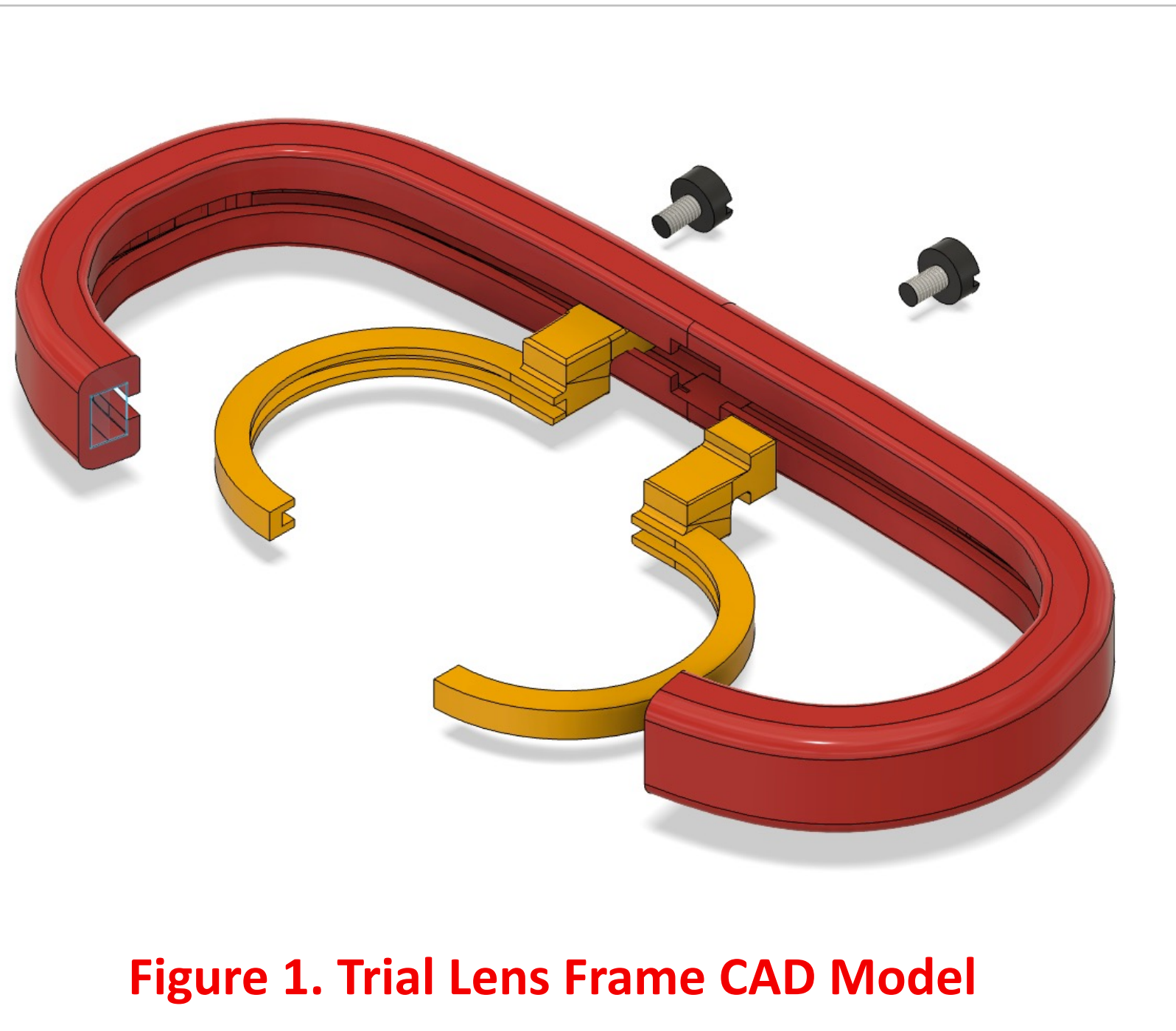


Figure 1. Trial Lens Frame CAD Model



Figure 2. Controller CAD Model

## Methods and Materials

- Trial Lens Frame:
  - CAD: Designed in Fusion360 and 3D printed.
  - Material: Polylactic acid (PLA) for 3D printed prototypes. Manufacturing material is rigid polyvinyl chloride (PVC) with PLA as an alternative.
  - Manufacturing: To be done via injection molding.
  - Features: Lens holders move along slider to allow for adjustment of the IPD and are secured in place with thumb screws.
- Controller:
  - Microcontroller: Raspberry Pi Pico W with on-board Bluetooth module and antenna.
  - Power Management System: 3.7 V 600 mAh lithium-ion battery with a TP4056 voltage/current regulator and linear charger module.
  - CAD: Designed in Fusion 360 and 3D printed.
  - Material: PLA for 3D printed prototypes. Manufacturing material is acrylonitrile butadiene styrene (ABS).
  - Manufacturing: To be done via injection molding.
  - Features: Starts Bluetooth advertising when switched on. Re-enters advertising for pairing when device is disconnected. Buttons for transmission of signals which can be purposed as needed for the eye exams.

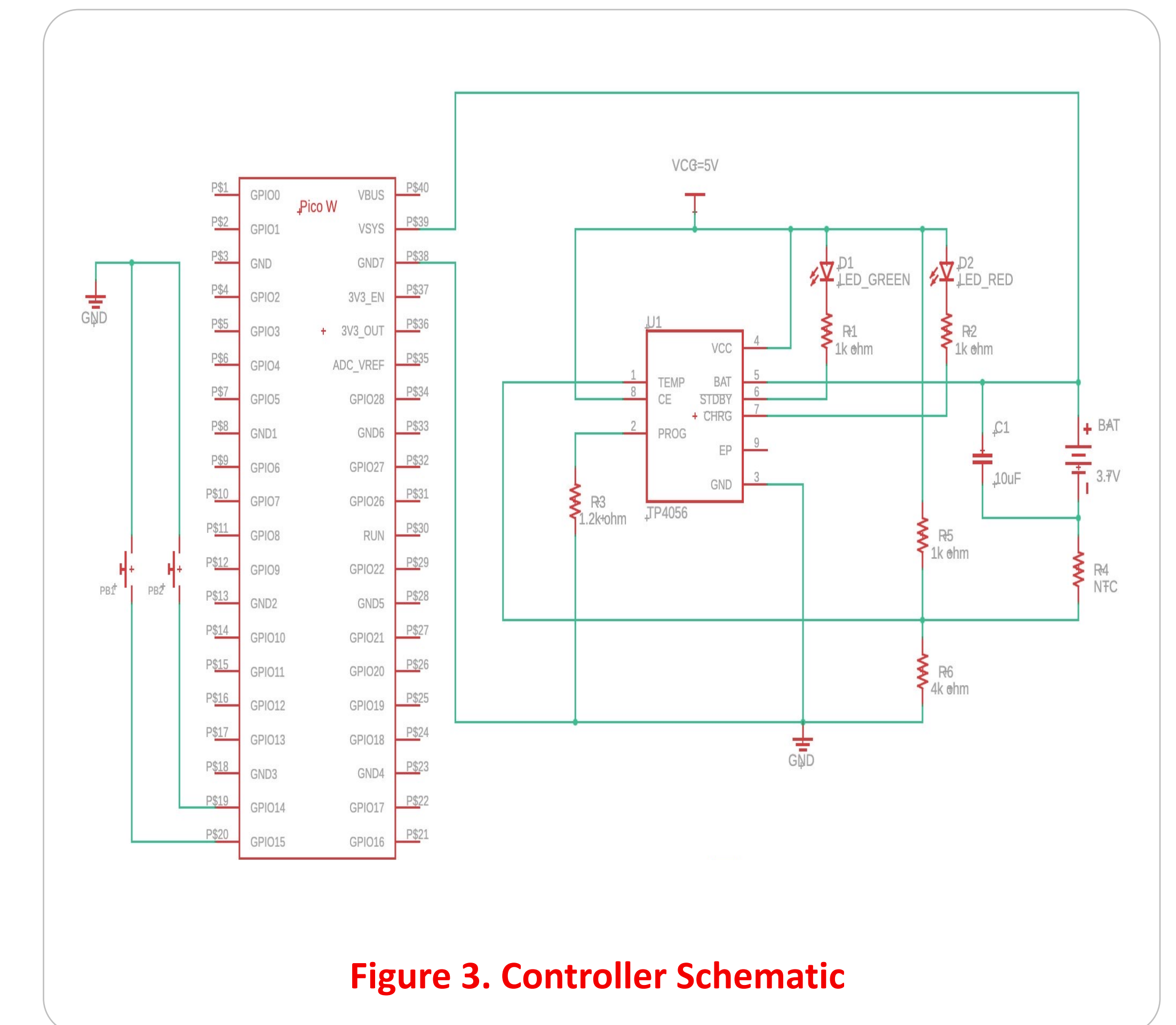


Figure 3. Controller Schematic

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