C.R.O.I Technologies

Pulsometer -
Preliminary Design Presentation

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Who Are We?

Cardiovascular
Rhythmic
Optical
Innovation

Conor Dunne

James Hadley, Jr.

Introduction & Objective

- **Commercial pulsometer**: measure patient's pulse and peripheral blood oxygen saturation
  - Used in medical and at-home care for patients with lung or heart conditions
  - Everyday workout or sleep monitoring

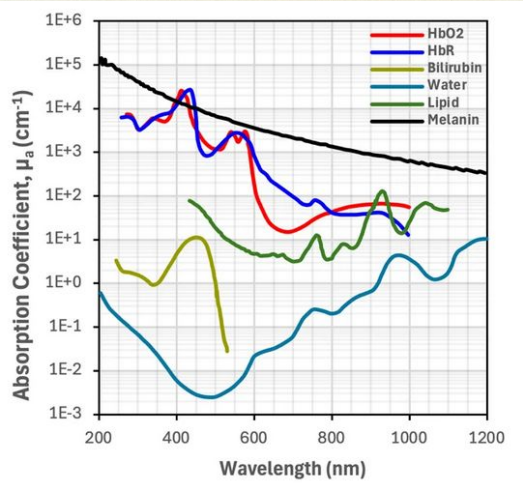
- **Our goal**: create a commercially viable, comfortable, wearable pulsometer to give a real-time display of users' pulse and heart rate in bpm.

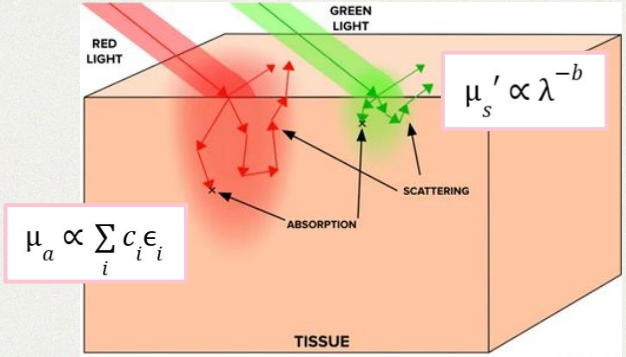
Photoplethysmography -Theory

- **Photoplethysmography (PPG)**: optical technique to measure bioactivity based on the Beer-Lambert law

- Light scattering and absorption dependant on:
  - Wavelength of light
  - Composition / condition of tissue
  - Blood flow

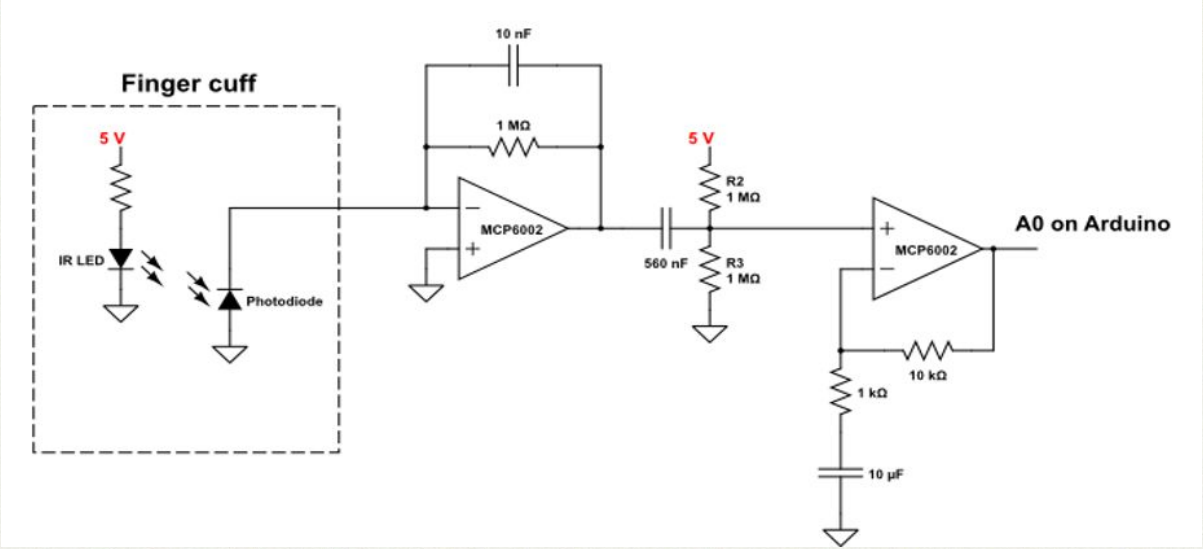
- Measure changes in absorbance from baseline that correspond to light absorbance from flow of oxygenated blood





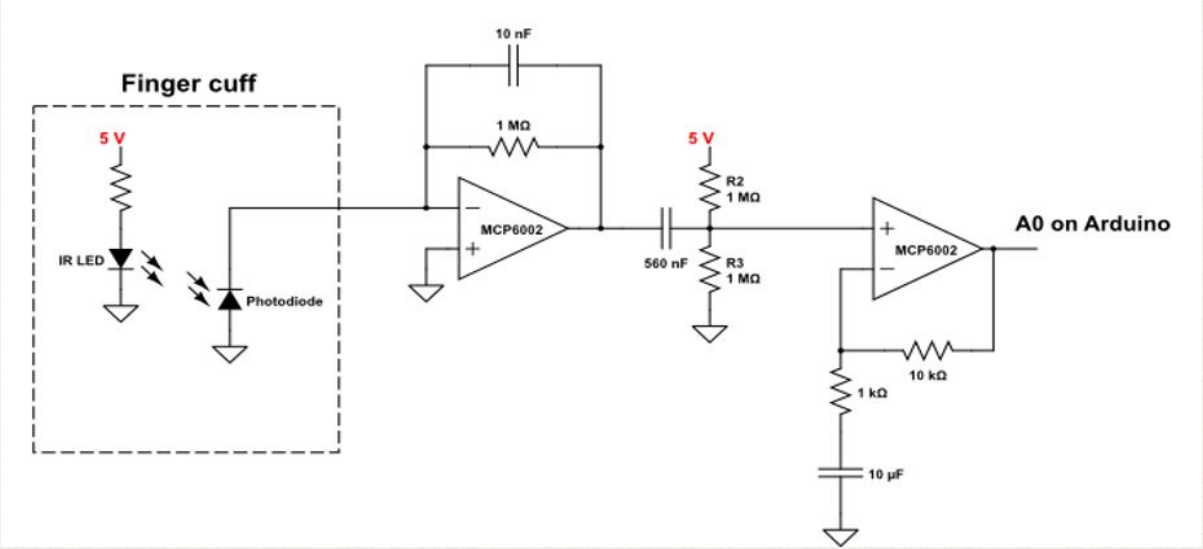
Circuit Design & Signal Processing

- Preliminary circuit includes:
  - UV LED and photodiode shining through finger
  - TIA amplifier (current → voltage)
  - high-pass filter (cutoff frequency 0.57 Hz)
  - Non-inverting amplifier (gain = 10)



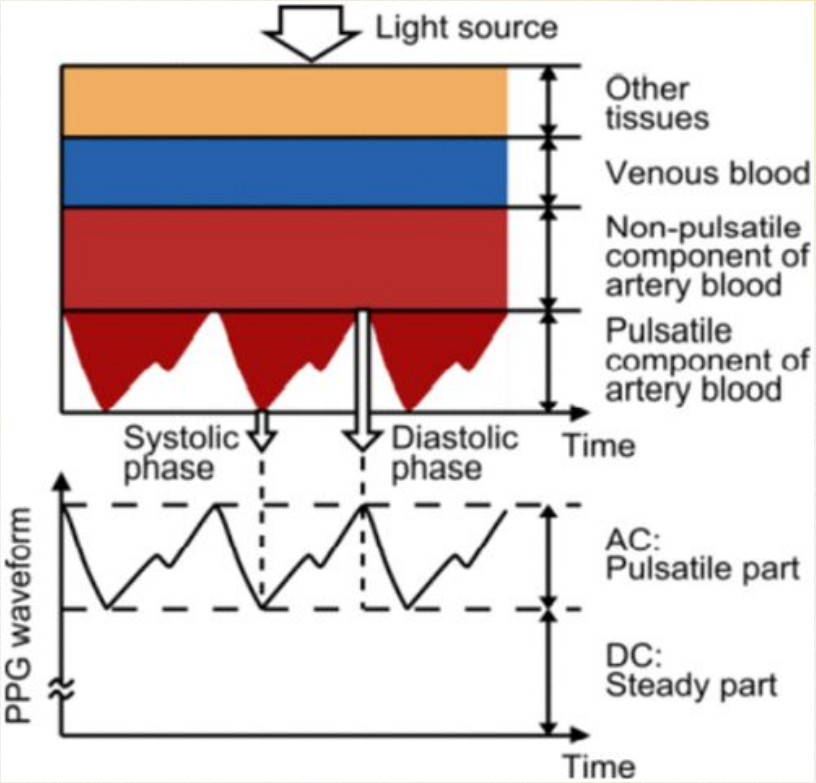
Circuit Design & Signal Processing

- Arduino processing:
  - Background subtracted signal
  - Real-time peak detection using instantaneous derivative
- Could add / change low pass filter and increase gain

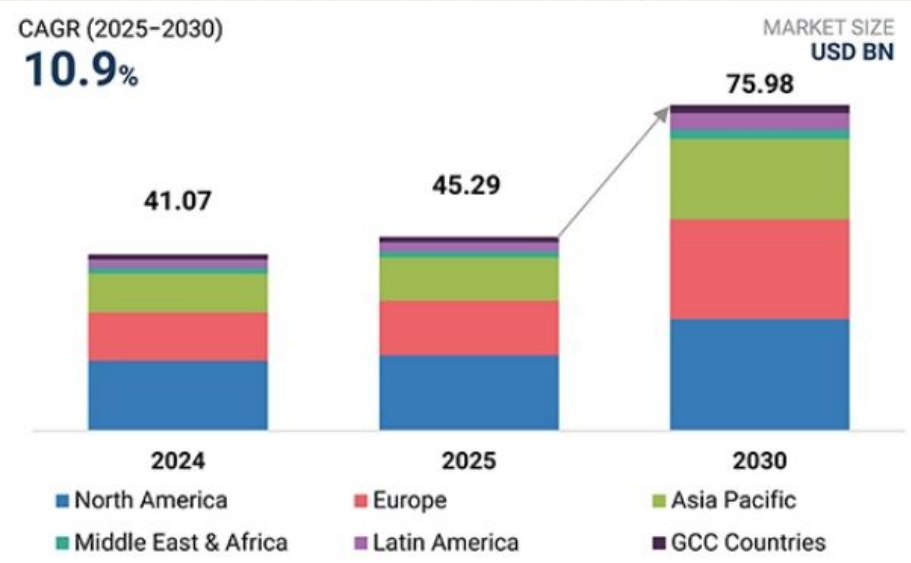


Engineering Design Constraints

- Signal / noise ratio
  - Signal incredibly small compared to background noise
  - filters and signal processing must be fine tuned, and might change per user
- Environmental / user interactions
  - Ambient room lighting
  - Air humidity and temperature
  - User skin / tissue composition and finger size
  - Slight user movement



Economic Considerations



MarketsandMarkets (2025)

- Wearable Healthcare Devices' Market
  - Trackers, Smartwatches, Patches, & Smart Clothing
  - $45.29 B in 2025
  - $75.98 B in 2030 (67.76% Increase)
  - CAGR of 10.9%
- General Market Analysis
  - Technological advances (AI)
  - Increasing health awareness
- Focus on Pulsometers
  - Potential demand

Economic Considerations

S

Strength: Our product only has one feature, allowing us to focus on having pulse readings more accurate than other products

W

Weakness: Since we are using an arduino, the product will be bulky and potentially difficult to wear

O

Opportunity: General health awareness amongst people is rising and doesn't require personal data

T

Threat: Most pulsometers on the market also function as an oximeter, making our product have less features than competitors

Timeline - Gantt Chart

TASK	PROGRESS	START	DAYS	END
Pulsometer Tech Project		**1/15/2026**	99	**4/23/2026**
Preliminary Design Report & Presentation	100%	**1/15/2026**	22	**2/5/2026**
Establish Github & Website	100%	1/15/2026	6	1/20/2026
Determine Parts List	100%	1/15/2026	8	1/22/2026
Draft Preliminary Design Report	100%	1/22/2026	12	2/2/2026
Finalize Preliminary Design Report	100%	2/2/2026	4	2/5/2026
Create Preliminary Design Presentation	100%	2/2/2026	4	2/5/2026
Milestone 1: Initial Project Design Presentation	56%	**1/22/2026**	29	**2/19/2026**
Create GANTT Chart	100%	1/22/2026	15	2/5/2026
Market Research: Nature of Market	80%	1/28/2026	9	2/5/2026
Market Research: SWOT Analysis	100%	1/28/2026	9	2/5/2026
Draft Initial Design Presentation	0%	2/6/2026	11	2/16/2026
Finalize Initial Design Presentation	0%	2/16/2026	4	2/19/2026
Milestone 2: Initial Prototype	0%	**2/5/2026**	29	**3/5/2026**
Initial Code	0%	2/5/2026	15	2/19/2026
Initial Physical Design	0%	2/19/2026	15	3/5/2026
Milestone 3: Intermediate Prototype	0%	**2/19/2026**	29	**3/19/2026**
Intermediate Code	0%	2/19/2026	15	3/5/2026
Intermediate Physical Design	0%	3/5/2026	15	3/19/2026
Milestone 4: Minimum Viable Product	0%	**3/19/2026**	29	**4/16/2026**
Final Code	0%	3/19/2026	15	4/2/2026
Final Physical Design	0%	4/2/2026	15	4/16/2026
Final Project Report & Presentation	0%	**4/2/2026**	22	**4/23/2026**
Draft Final Project Report	0%	4/2/2026	19	4/20/2026
Finalize Final Project Report	0%	4/20/2026	4	4/23/2026
Create Final Project Presentation	0%	4/20/2026	4	4/23/2026

- 6 major sections with 6 deliverables
  - Preliminary Design Presentation
  - Initial Project Presentation
  - Initial Prototype
  - Intermediate Prototype
  - Minimum Viable Product
  - Final Project Presentation
- Future updates planned for Milestones 2, 3, & 4
- Target end date is 4/23/2026

References

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