Detecting Disease Contact

Circuit Breakers

Version 2.3

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Requirements Document

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A. Project Overview

The rapid spread of and efforts to combat the COVID-19 pandemic in recent years laid bare how essential contact tracing and disease vector tracking are to epidemiology. The global public and national medical establishments alike were brimming with questions, concerns, and speculation about the chain of transmission.

In order for medical researchers to collect data and trace contact, maintain exposure standards, and provide improved insights to medical institutions and policymakers, it would be very beneficial for field researchers and other professionals to be able to exactly track the number of people they come into contact with and the frequency of contact.

B. Current Problems and Proposed Solutions

We are proposing a camera-equipped vest to accurately track the number of people that come into a two meter radius of the wearer, paired with a mobile app that allows the user to easily view the data. The cameras will work in tandem with algorithms running in the cloud to create a “snapshot” of every instance of a new individual entering and leaving the two meter radius, providing data points for further analysis, such as creating heatmaps, tracing spread, and reporting potential transmission.

Previous implementation is still not accurate in detecting disease contacts. Probably, we need more sensors and background processing to accurately detect contacts. The data from the sensors needs to be computed on the vest and sent to the cloud. The processed data can then be used to make decisions about the contacts. A simple smartphone application can also analyze the data and provide statistics about the contacts.

C. Requirements

1. Functional Requirements

ID	Functional Requirements	Team Member Responsible	Effort (%)	Verification
FR1	The system should operate in both day and night conditions.	Jared Beyers	20%	Testing
FR2	The system should trigger the camera system when it detects possible human presence.	Jared Beyers	30%	Testing
FR3	The system should use computer vision to determine if a possible presence is a human.	Ronil Doshi	25%	Testing
FR4	The system should algorithmically determine	Ronil Doshi	30%	Analysis

	and record the closest distance for each contact.			
FR5	The system should detect all humans exiting 2 meter radius.	Jared Beyers	30%	Testing
FR6	The system should track all human subjects so long as they remain in the 2 meter radius.	Ronil Doshi	35%	Testing
FR7	The system should record GPS location for all encounters.	Isaiah Maberry	10%	Testing
FR8	The cloud should calculate and store data based on frequency of contacts.	Tarod Anderson	15%	Demonstration
FR9	The system should send data to the cloud for storing and access.	Tarod Anderson	25%	Demonstration
FR10	The smartphone app should access data from the cloud.	Tarod Anderson	25%	Demonstration
FR11	The smartphone app should display all contacts with their respective timestamps and locations on a map, along with the total number of contacts.	Jennifer Tapia	25%	Demonstration
FR12	The smartphone app should have a searchable list of contacts. With each contact showing data on duration, distance, timestamp, and location.	Jennifer Tapia	30%	Demonstration
FR13	The smartphone app should display frequency of contacts, with filters such as per hour, per day, and per week.	Jennifer Tapia	20%	Demonstration

FR14	The smartphone app shall interact with cloud database to secure user logins and protect access to contact data.	Isaiah Maberry	25%	Testing
FR15	The system should delete all user video after processing is complete.	Ronil Doshi	10%	Demonstration
FR16	The smartphone app should display power levels of each subsystem and the central system.	Isaiah Maberry	15%	Inspection
FR17	The subsystems should send data to the central system via wifi.	Isaiah Maberry	15%	Inspection

2. Non-Functional Requirements

ID	Non-Functional Requirements	Team Member Responsible	Effort (in %)	Verification
NFR 1	The system should be embedded into a wearable vest.	Tarod Anderson	25%	Inspection
NFR 2	The system should be discrete.	Tarod Anderson	10%	Inspection
NFR 3	The system should use a battery for 12-hour operation.	Isaiah Maberry	15%	Analysis
NFR 4	The system should be under 1 KG.	Ronil Doshi	10%	Inspection
NFR 5	The system shall be implemented on a PCB that ensures compact size and reliable signal routing.	Isaiah Maberry	20%	Inspection
NFR 6	All components shall be housed in enclosures to ensure protection and user comfort.	Jared Beyers	20%	Inspection

NFR 7	The smartphone app should be professional, elegant, and user friendly.	Jennifer Tapia	25%	Inspection

3. Constraints

a. *Money is a constraint, as there is a $1000 budget for the product.*

b. *Time is a constraint, as there are 32 weeks to complete the product.*

c. *The system must use commercial components, as it is a proof of concept prototype.*

d. *The product's packaging and size should allow for comfortable wear through everyday activities.*