THERMONITOR

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Problem Statement

Handheld Thermometers

4 in. detection radius Does not conform with social distancing

Standalone Kiosks

High price point

Marketed towards businesses and companies





• Use Cases

Improved safety

Standalone smart thermometer Placed near entrance of rooms Mask detection

Temperature Monitoring

Scan ID to initialize temperature check

Contact Tracing

Record individual profiles

One-stop Management Platform

Accessibility on mobile devices through IoT



Requirements

Temperature Sensing

Accurately detect temperature of person standing in front of the camera

RFID

Scan and send RFID information and turn on Jetson accordingly

Facial Detection

Detect and show bounding box around person's face. Identify if they are wearing a mask.

IoT External Platform

Show logs of recorded temperatures mapped to corresponding RFID on admin accessible external platform

Low Power

Low Cost

Solution Approach

Temperature Sensing

FLIR IR Lepton 3 Camera PureThermal 2 Smart I/O Board Radiometric measurement

RFID

X-NUCLEO-NFC02A1 RFID scanner Connected to STM32 Nucleo-L476RG board

Low Power

Nucleo board used to send a "wake up" signal to the Jetson nano

Facial Detection

Raspberry Pi Camera Module V2 Haar classifier algorithm Online data training sets

IoT External Platform

Database for RFID profiles App to visualize temperature logs





Device Design

Display	RGB Camera IR Camera	
Room DH 2210	MASK Image: Constraint of the second sec	TEMPERATURE 98.6 F PROFILE John Smith
		FID Scanner

Platform Design



Technical Challenges

High frame accuracy of facial and mask detection

Sending data through the cloud

Encryption and decryption of messages

External platform with creation of a database

Choosing the most optimal communication protocol

Metrics and Validation

Components	Validation Methods	Metrics		
RFID Scanner	Testbench with multiple sample RFID's	99% accuracy		
Facial Detection	ML facial test data with and without masks	90% face detection 80% mask detection 10% false positive 1-2% false negative		
Temperature Sensing	Verify objects with different temperatures (cold/warm/hot)	Within 2 degrees of error 2s measurement response		
IoT External Platform	Check if logs are accessible and mapped to correct RFID Test samples to ensure platform is easy to navigate	User testing and feedback		

Division of Labor									
Jiamin Hardware Focus	Iris Software Focus	Minji Software Focus							
 RFID scanner functionality with Nucleo Nucleo controlling on/off of Jetson for power efficiency Communication between Nucleo and Jetson 	 RPI and IR camera integration with Jetson Facial/Mask detection implementation Broadcast of information on display 	 Communication from Jetson to cloud Message transmission IoT solution development 							

Gantt Chart

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Legend:	Minji	Jiamin	Iris	Team	l.								
Milestone Descriptions Mer		September		nber	r October								
		Ivien	Nember		- 10/4	10/5 - 10	0/11	10/12 - 10/2	18 10/19 - 10/2	5 10/26 - 11/1	11/2 - 11/8		
MVP													
	RPI video transmission to Jetson Ir			S									
Legend:	Minji	Jiamin	li li	ris	Tea	m							
							November December						
	Mileston	e Descrij	otions		Member		11/9	- 11/15	11/2	16 - 11/22	11/23-11/29	11/30 - 12/6	12/7 - 12/13
Final Projec	t												
	Integration of all the components		Т	eam									
	Slack		Team										
	Database of RFID and ability to		Minji										
	Finalize App/Website			Minji									
	Program necessary RFID tags on Nucleo		ucleo	Jiamin									
	Push for power efficiency on Nucleo		0	Jiamin									
	Push for power efficiency on Jetson		n		Iris								
	Push for facial/mask detection accuracy			Iris									
	Final Project Report		Т	eam									
	ыаск			IVII	nji								
	Develop basic	app framew	vork	Mi	nji								
	Design docum	nent		Tea	m								
	Facial/Mask d	letection acc	uracy	Iri	S								
	Slack			Iri	S								
	Message Tran	smission acc	uracy	Mi	nji								
	Slack			Mi	nji								
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