🖌 Airline 🚥 🖓

Team B6 -My TagMy Bag



Lee Poirier, Caroline Liu, Anisha Nilakantan

FLIGHT ECE 500
GATE B6
SEAT S23

BOARDING PASS

Airline ••••••••••••••••••••••••••••



Use Case

01 🕕 Problem

There is a **lack of luggage security** at the baggage claim from both **malicious** action and **accidental** mishandling.

02 | Solution

03 | 🖅 Areas

A system that checks you are leaving the airport with your own bag, using paired tags (one PCB w/ RFID, one RFID). A scanner will read the RFID info as it exits the airport, and send the passenger a notification if the suitcase does not have a pair, sounding alarms and allowing the user to locate their luggage.

Software Systems, Analog Circuits, Hardware Systems (Embedded Devices)

Airline ••••••••••••

Use Case Requirements (1)

Scanner Range

Scanner Duration

Bluetooth Range

Scanner Accuracy

5 seconds

3 ft

100 meters

100% Hit on Thefts 20 % False Hits Necessary range for most widths of single doors

Too short -> false alarms Too long -> culprits slip through

Ability to talk to RPi from any point in the airport

Always catch mispairings, at the cost of false positives.

ZK

Time between stolen

Use Case Requirements (2)

Notification speed	20ms	bag or ripped tag and the owner receiving a notification
Battery Life	2 Years	Industry standard coin batteries have this length of life
PCB Tag Size	4x4x0.3cm	5-25 mm in diameter and 1-6 mm tall for coin battery, 6x6mm for STM32

Airline •••••••••••



Technical Challenges (1)

01 | TSA Approved Tag 02 | Durability of RFID Tag

03 | Compact Design TSA regulations and restrictions places significant design constraints on our product, such as batteries.

When you check-in a luggage, not only do the workers throw it on the conveyor belt, but you can bet your luggage experiences as much of a rough jet-lag as you.

Our design and fabrication should look sleek and professional, and be small to minimize added weight and costs.

Airline ••••••••••••



Technical Challenges (2)

Parts 04 | Ordering

05 | Bluetooth pairing

06 | Communication within airport

During a recession, the turnaround time for ordering PCB or other parts could be long start off with breadboard

Navigating permissions so that Bluetooth tags are secure and can only transmit to the RPi, and understanding phone Bluetooth restrictions.

People aren't always connected to Wifi in airports-is Bluetooth range enough to notify their stolen bags?



Solution Approach (1)

Щ Т

Luggage Tag

Will be a small PCB that includes an STM32 + RAK4600 Bluetooth module, accelerometer for motion, break beam sensor, passive HF RFID with Bag ID.



Passenger Tag

Programmed PCB tag to read in from RFID Scanner and RPi, containing Destination + all registered Bag IDs.



| Scanner

RCF22 into a RPi to read RFID information in real time linux. Communicates alerts over wifi if bag passes through with no/wrong passenger. Sets off a buzzer alarm. Airline •••••••••••••••••••••••••••••••••



Solution Approach (2)



Interfaces with RPi module to notify user of alerts. Database of passengers, destinations, registered IDs, and when bags passed through scanners. Users can log in for their flights.



Scanner will be able to sound an alarm if it doesn't scan two matching IDs. Bag alarm will sound if tag is taken off before going through scanner.





Scanner Timing

scanner speed and

timing for 5sec

Testing for

1

|Scanner Range

Testing for range of the scanner to detect RFID tags within 3ft



Scanner Accuracy

Performance testing for 100% true positives on thefts and 20% on false positives



| Alert Timing

Testing for notification speeds of within 20ms through bluetooth and wifi communication, if alert is triggered Airline •••••••••••





| Motion Sensor

Testing for motion sensor functionality and ability to wake up from sleep



| App

Testing for app functionality and connectivity between user and alert notifications

Tasks and Division of Labor

MyTagMyBag Project Schedule

Nish:

Backend App + Bluetooth communication

Caroline:

PCB/person tag + frontend app

Lee:

RFID Scanner + Raspberry Pi communication

All: Testing + integration



	2/6/2023 (Mon			y Week:		
Project Manager: 1	ECE Capstone					6 Feb 2023 13 Feb 2023 20 Feb 2023 27 Feb 2023 6 Mar 2023 13 Mar 2023 20 Mar 2023 27 Mar 2023 6 Mar 2023 13 Mar 2023 20 Mar 2023 27 Mar 2023 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1
Taok Load	Start	End	Days	% Done	Work	м т w Th F Se Su M T w Th F Se
PCB Tag	Mon 2/08/23	Thu 3/16/23	39		29	La contra c
Research RFID tag shapes	Mon 2/06/23	Wed 2/08/23	3	0%	3	
	Wed 2/08/23	Wed 2/08/23	- 1	0%	1	
	Thu 2/09/23	Wed 2/15/23	7	0%	5	
Program and test REID (an	Thu 2/16/23	West 2/22/23	7	0%	5	
			5	0%	3	
Program motion sensor to start/stop microcontroller	Tue 2/28/23	Mon 3/06/23	7	0%	5	
Program breakbeam sensor	Tue 3/07/23	Thu 3/09/23	3	0%	3	
	En 3/10/23	Thu 3/16/23	7	0%	5	
		Thu 3/16/23	7	0%	5	
RFID Scanner + PI + Alarm	Wed 2/08/23	Thu 3/23/23	44		32	
Order scanner + pi	Wed 2/08/23	Wed 2/08/23	1	0%	1	
	Wed 2/15/23	Tue 2/21/23	7	0%	5	
	Wed 2/22/23	Thu 2/23/23	2	0%	2	
	Fri 2/24/23	Thu 3/02/23	7	0%	5	
	Fri 3/03/23	Thu 3/09/23	7	0%	5	
Rearch how to talk to app from backend	Fri 3/10/23	Thu 3/16/23	7	0%	5	
	Fri 3/17/23	Thu 3/23/23	7	0%	5	
	tris rowl					
		Sat 3/25/23	48		35	
		Wed 2/08/23	3	0%	3	
		Wed 2/08/23	1	0%	1	
		Wed 2/15/23	7	0%	5	
			7	0%	5	
	Thu 3/16/23		5	0%	3	
	Tue 3/21/23		5	0%	4	
					2	2
		Tue 3/28/23	26		18	
			7	0%	5	
			7		5	
			7		5	
		Tue 3/28/23	7	0%	5	
	Fri 3/17/23	Sun 3/19/23	3	0%	1	
			7		5	
			7	0%	5	
		Contraction of the second second		1000		
		Fri 3/31/23	. 12		10	
			2	0%	2	
					3	
			3		1	
					4	
					5	
		en 3/31/23	2	w76		
	and (CHV)					
	rows.					
			1		1	
[Level 2 Task] . [Level 3 Task]	Mon 2/06/23 Mon 2/06/23	Mon 2/08/23 Mon 2/08/23		0%	1	
	Table Land PCD TD Procession RTD to tags a space of procession of the space of th	Inst Lond Entry PDE Trg More 20062 Desmarch RHD bag shapes More 20062 Order parts (retrocoarticelles, menors, RHD bag) Weid 20052 Create benedicated to be la functionation The 20062 Program benedicated to be la functionationation The 20062 Program benedicate source to be later to the 200623 Fig. 300723 Program benedicate source to be later to the read- The 200623 Program benedicate source to be later to the read- Fig. 300723 Program problem to retroine damp Weid 200623 Program problem to be of damm Fig. 30022 Program problem to be of damm Fig. 30023 Program benedicate source to formation Fig. 30023	PDE Trig Mol. 200423 Thui. 210423 Research RTD tog strates Mol. 200423 Wei 200423 Other partie (interscentrichte, sensers, RTD tog) Wei 200423 Wei 200423 Create livestiftande to test functionality Wei 200423 Wei 200423 Program tradicational to test functionality Thui 210423 Wei 200423 Program tradicational to test functionality Thui 210423 Mol. 22023 Mol. 22023 Program tradicational to test functionality Thui 210423 Thui 210423 Mol. 22023 Program tradicational to test functionality Thui 210423 Thui 210423 Thui 210423 Stack Figh 31003 Thui 310423 Thui 310423 Thui 310423 Stack Figh 31004 Thui 310423 Thui 32023 Thui 320	Table Lease State Extr Days PCE Trip Mice 200623 Mice 2006	Table Land Statt End Page Page Page PCE Trg Max 20022 The 21022 3 Order parts (microcorreline, nemmors, RPD tags) West 20023 1 Order parts (microcorreline, nemmors, RPD tags) West 20023 1 Order parts (microcorreline, nemmors, RPD tags) West 20023 1 Order parts (microcorreline, nemmors, RPD tags) West 20023 1 Order parts (microcorreline, nemmors, RPD tags) West 20023 1 Order parts (microcorreline, nemmors, RPD tags) The 30263 1 Order parts (microcorreline, nemmors, RPD tags) The 30263 1 Order parts (microcorreline, nemmors, RPD tags) The 30263 1 Order parts (microcorreline, nemmors, RPD tags) The 30263 1 Order parts (microcorreline, nemmors, RPD tags) 1 0 1 Order parts (microcorreline, nemmors, RPD tags) 1 0 0 1 0 0 1 0 0 1 0	Inst End End End Page Pa



Thievery Flow

Passengers A checks-in; receives set of paired tags

Thief steals A's bag, goes through scanner. Security stops Thief and verifies A is the owner before returning luggage.

01

02

04

03

Bags go on flights (motion sensor conserves battery), arrive at baggage claim Scanner sees A's bag without seeing A within 5s; set off alarm, identifies A as the owner of the bag using the Bag ID and notifies A via app.

05