

CISSS!

Project Description

- In this project, the LAMBDA is tasked to design a device to control undesirable behaviors of pets.
- •The device consists of 2 units; the *master unit* and the tag.
- •Tags can be used in two different types; zone tags and doorway tags.

Technical Specs

Tag Enclosure Dimensions: 67 x 77 x 16.2 mm

Tag Enclosure Weight: 34 g

Master Enclosure Dimensions: 43.2 x 77 x 16.2 mm

Master Enclosure Weight: 29 g

PCB dimensions: 40.14 x 27.56 x 7.2 mm

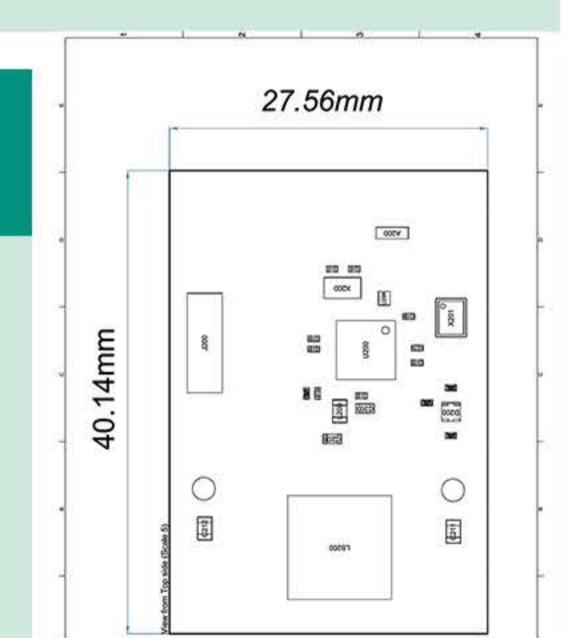
PCB Weight: ~25 g Total Master Weight: ~54 g

Minimum distance between unassociated tags: 2 m

Average Power Demand: 30 mW

Deliverables

- Master Unit for Pets
- Tags for Forbidden Zones & Doors
- Device Batteries
- Warranty Certificate
- User Manual



Method of Solution

-The RSSI for each signal received from tags is measured.

-These measurements are used in a distance estimation formula. distance (cm) = 100 * 10(RSSI_{ref} - RSSI_{meas})/(10n)

RSS_{ref} is the empirically found RSSI value for 1 meter, RSSI_{meas} is the measured RSSI value, n is the propagation exponent representing the environment found empirically.

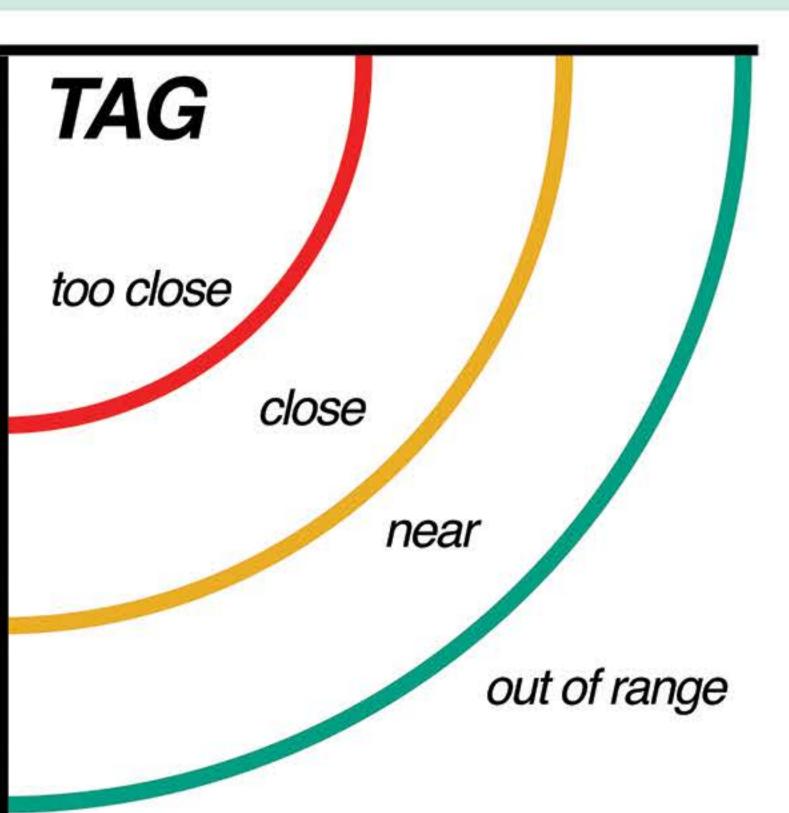
-The distance calculations are filtered.

 $distance_{filtered}$ (cm) = $distance_{prev}$ (1-k) + $distance_{raw}$ * k

distance is the computed distance value,

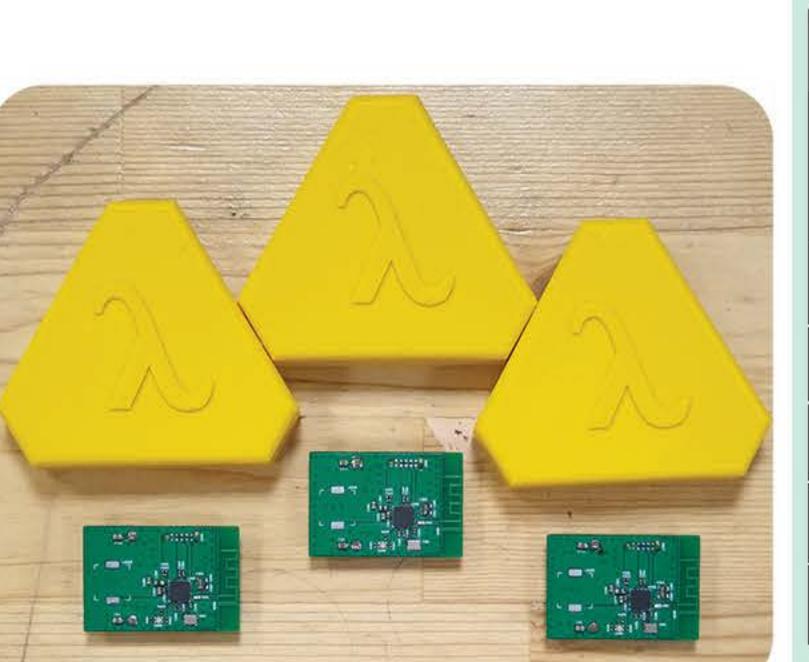
distance or is the distance value that was computed in the previous cycle, distance is the unfiltered distance value found by the prior formula.he empirically found RSSI value for 1

-The filtered distance values are used to alert the pet according to the state the distance falls into.



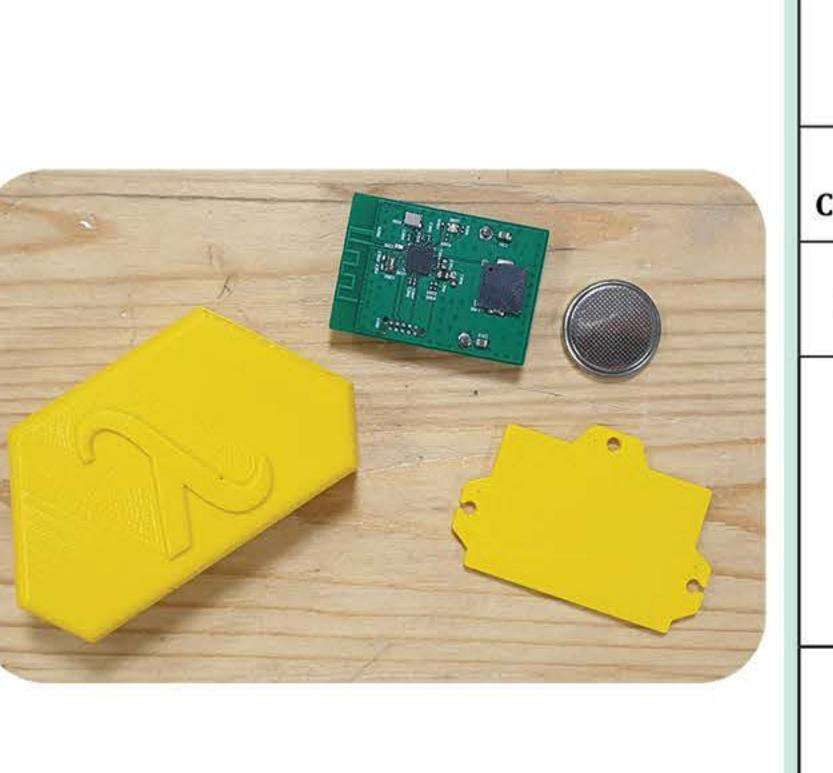


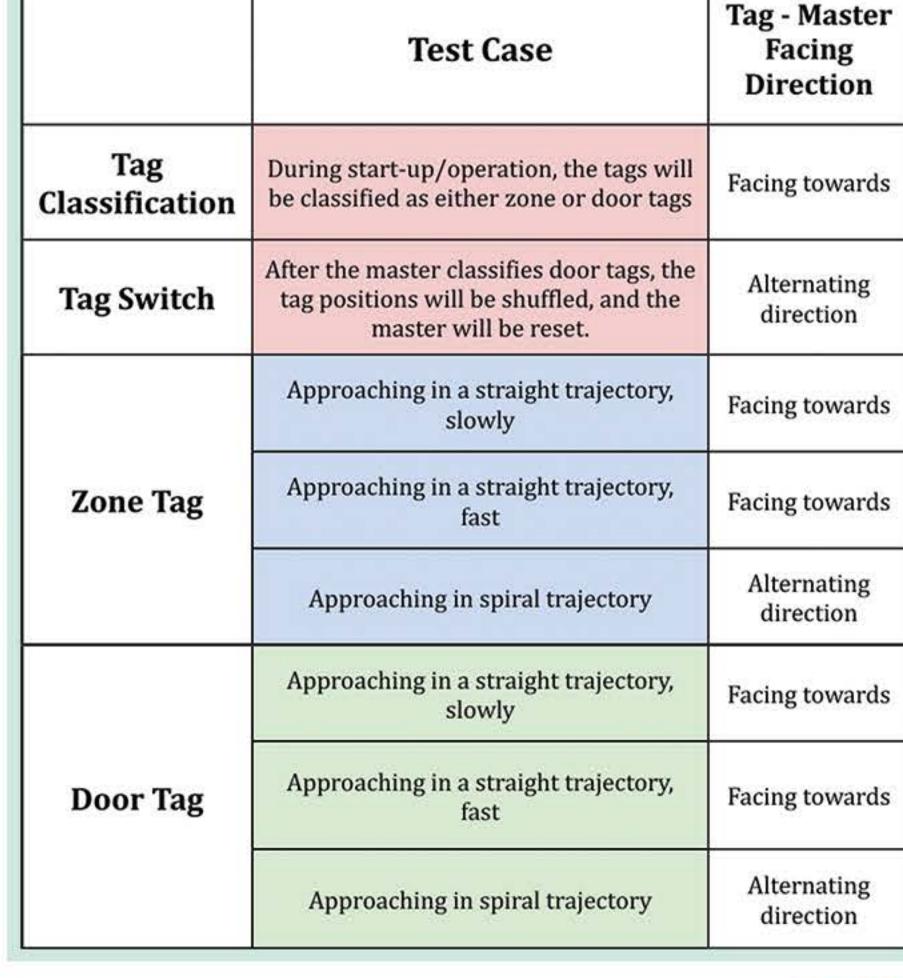




Obstruction Testing Scenarios			
	Obstruction Type	Pass/Fail	
Zone Tag	Metal	*	
	Wood	✓	
	Human Hand	1	
	Human Body	×	
	Foam	1	

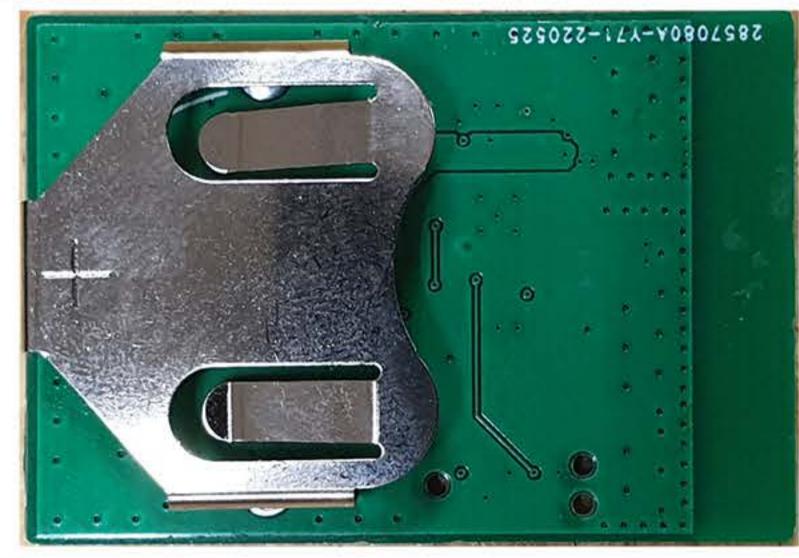
Miscellaneous Testing Scenarios





67 16,2 mm 77 mm 2 16,2 mm 77 mm

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Outstanding Features

Low-Cost

With a cost of 17.77\$, the device is affordable for most pet owners.

Practical

The system can be used in any room with many possible tag placement options.

Small in Size & Weight

An average pet can wear the device comfortably.

With the discussed features, LAMBDA is way ahead of its competitors.

Test Results

		Tag-Master Facing Direction	Measurements						
	Test Case		Far State Ent Distance (cm)	A STATE OF THE PARTY OF THE PAR	Medium State	e Entry(60cm) n) / Error (%)		Entry(40cm) n) / Error (%)	
	Walking towards & away	Facing towards	108	35,0	82	36,6	52	30,0	
Zone Tag	Walking towards & away	Facing 45°	84	5,0	64	6,6	37	-7,5	
	Walking towards & away	Facing 90°	63	-21,2	48	-20,0	30	-25	
	Walking towards & away	Facing 135°	35	-56,2	*	*	*	*	
	Walking towards & away	Facing 180°	78	-2,5	63	5,0	42	5,0	
	Walking towards & away	Facing 225°	74	-7,5	67	11,6	46	15,0	
	Walking towards & away	Facing 270°	58	-27,5	28	-38,3	*	*	
	Walking towards & away	Facing 315°	74	-7,5	53	-11,6	37	-7,5	

• The height difference between master and tag is 30-40 cm (an average pet height) in all test cases above. The distances are direct distances, NOT projectile distances.

Shareholders

 Necdet Can Sönmez Alper Saraç

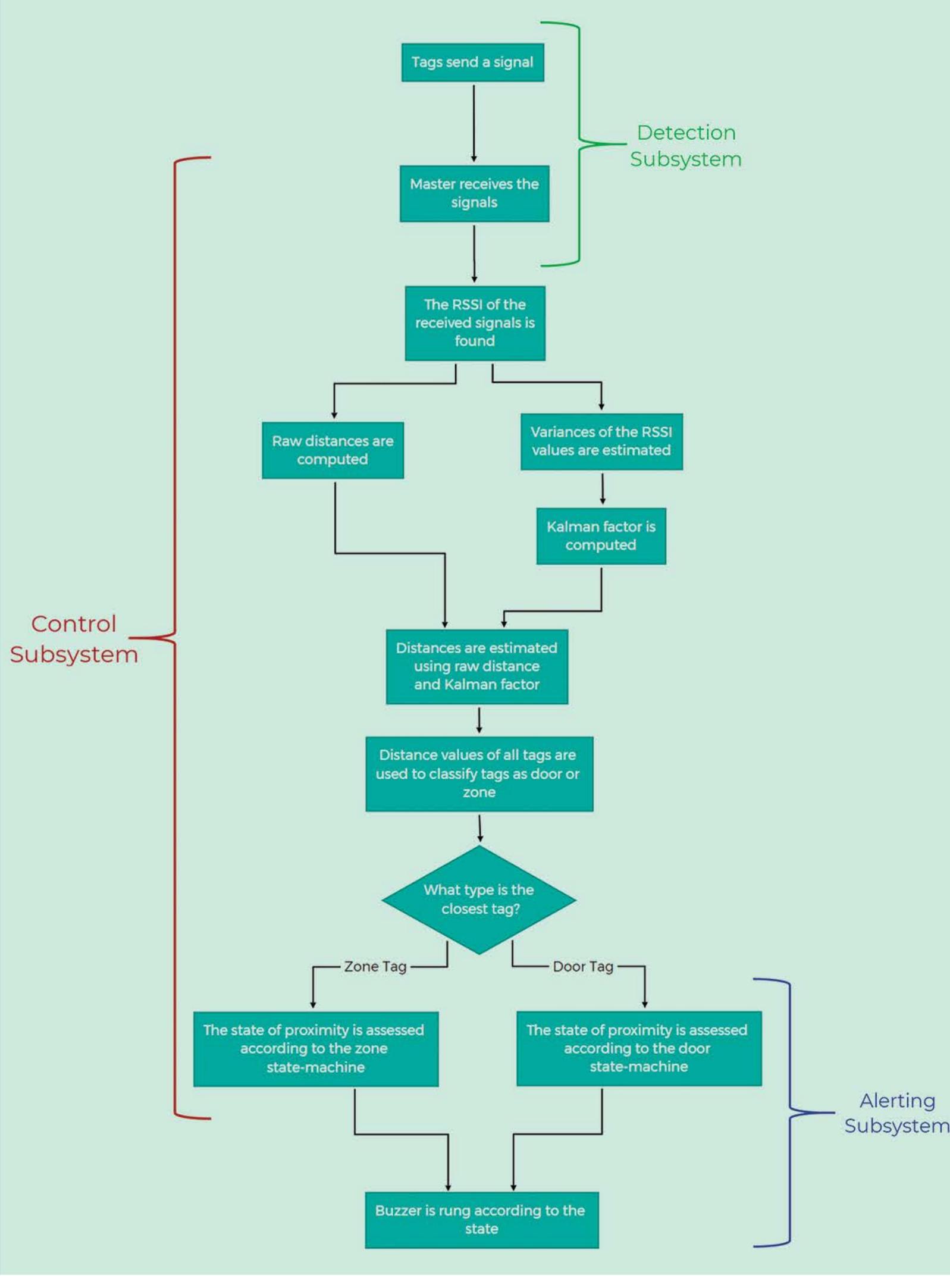
•Mustafa Barış Emektar •Berk Erhan Yüksel •Furkan İtkü

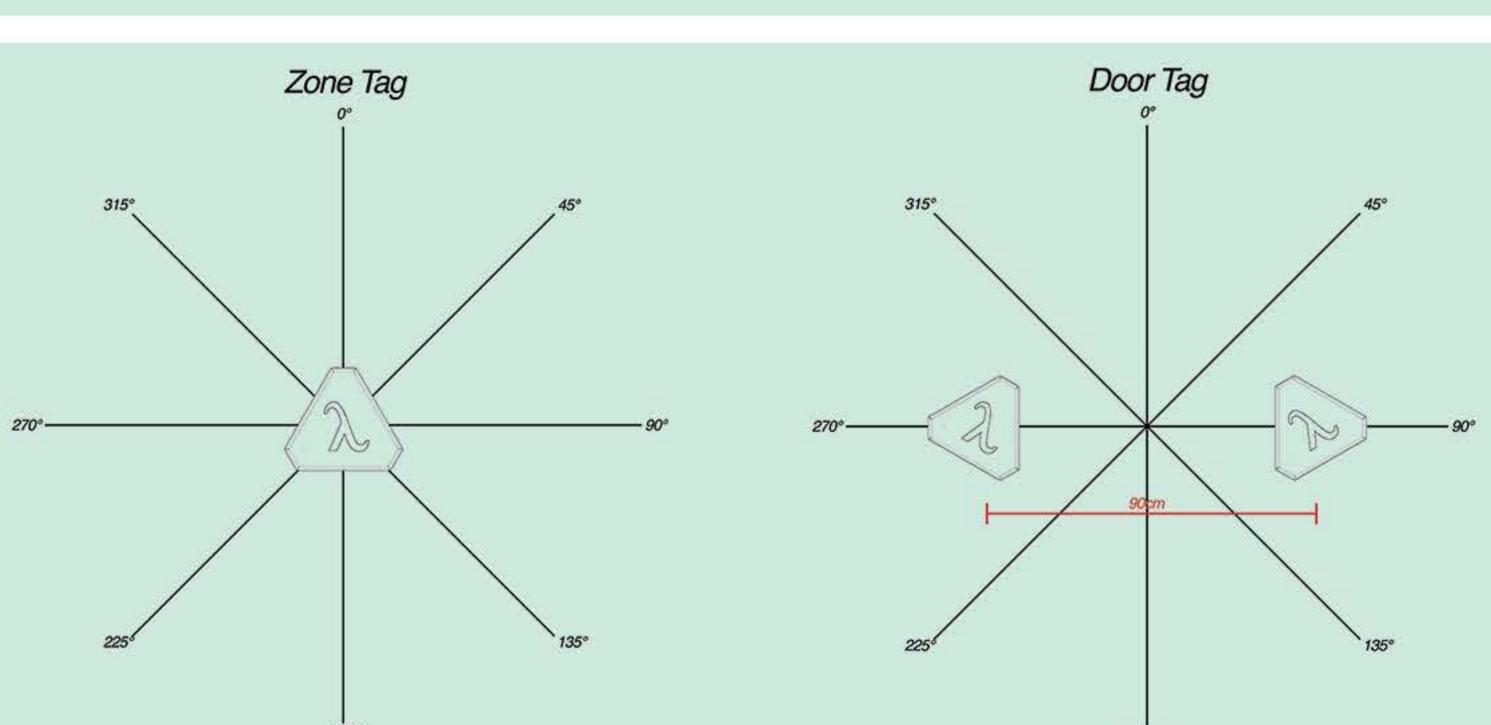


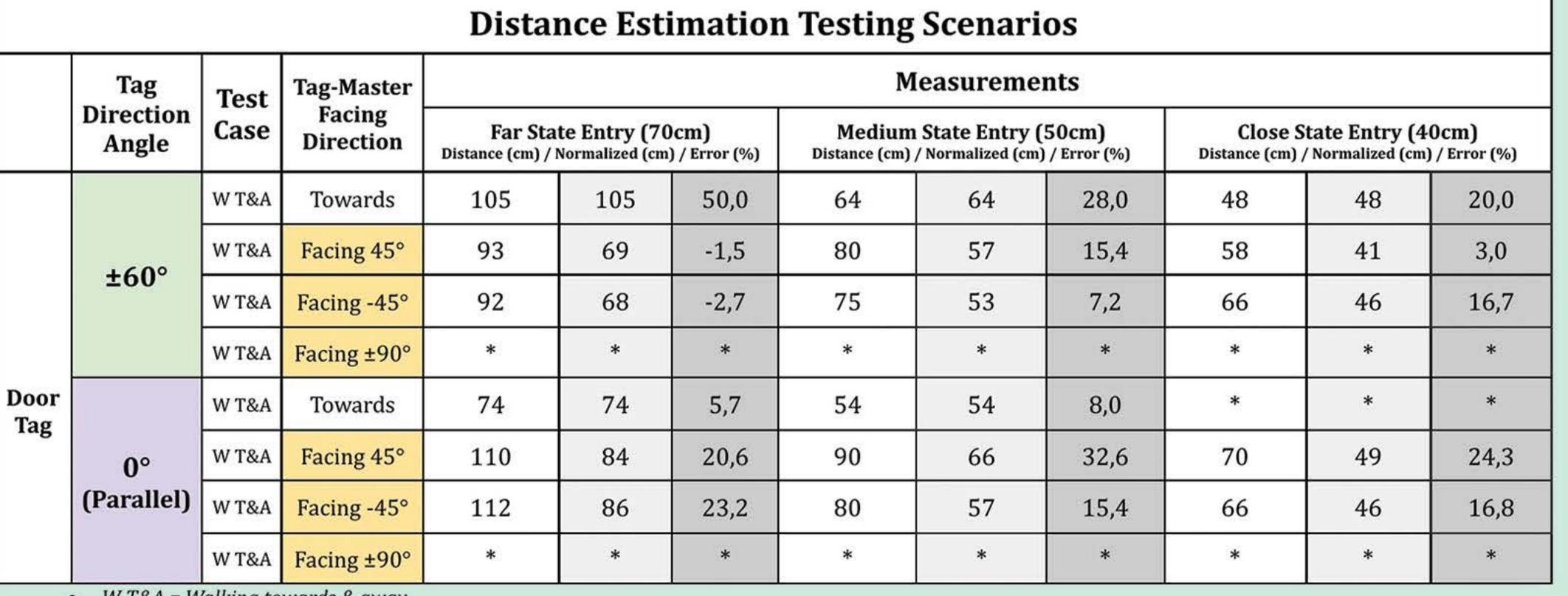
Budget

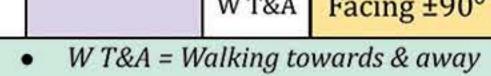
Items	Number of Pieces	Unit Cost(*)	Total Cost	
PCB (for manufacturing)	4	0.8 \$	3.2 \$	
"CC2640 Microcontroller - Texas Instruments"	4	1.78\$	7.12 \$	
Buzzer	1	0.53 \$	0.53 \$	
Balun	4	0.23 \$	0.92\$	
Other Passive Components	-	.=	2 \$	
Power Supply "Button Battery – 3.3V"	4	0.5 \$	2 \$	
Mass Production Enclosures	4	0.5 \$	2 \$	
Total Final P	17.77\$			

Flowchart







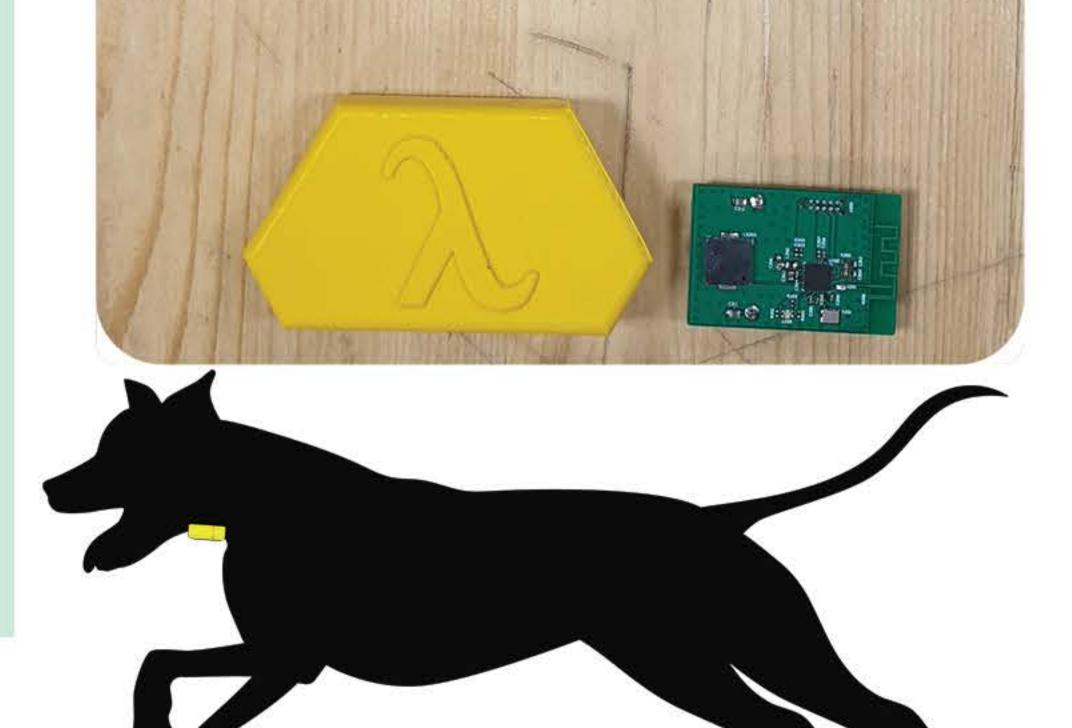


 A result of "*" implies that the state was not observed. • The height difference between master and tag is 30-40 cm (an average pet height) in all test cases above.

 The distances are direct distances, NOT projectile distances. • Normalized Distance means "distance to closest tag". For the door tag cases, the distance to the center of the doorway was measured for practical

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purposes. In the error calculation, the distance to the closest tag was used.