PathFindr

University of Ottawa GNG 2101 B October 14th, 2020 Adam Walters 300109768 Eric Chen 300136076 Brendan Sommers 300115531 Jarrett Goodwin 300074553 Steve (Tianchen) Cai 300127732

Problem Statement

Design a system that can be accessed by visually impaired and other library users through an app that allows users to navigate to important locations on the first floor of the Morisset Library.

Project Plan

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Customer Needs

- 1. The system assists visually impaired users
- 2. The system is accessed through the users' phone
- 3. The system is used to navigate to key locations within the library
- 4. The system is reliable
- 5. The system is for the first floor of the library
- 6. The system is accessible for everyone, not only those who are impaired
- 7. The system is easily modifiable
- 8. The system notifies users via auditory and visual notifications
- 9. The system costs less than similar products on the market
- 10. The system enables staff to broadcast new announcements and change existing ones

Benchmarking

- Wayfindr is used in the London Underground
- Key2Access (K2A)
 is used in an
 Ottawa Public
 Library and City
 Hall

Metric	Wayfindr	K2A (OPL)	Units
Time from app start to navigation start		10	Time (s)
Customer Satisfaction	4/5	2/5	Subjective
Effective range of the beacon	100	5	Distance (m)
Battery Life of beacon	3		Years
Time to reprogram beacon locations			Time (s)
Cost per beacon	\$132.64		CAD\$
Beacon Weight	86		Weight (g)
Beacon Size	6.9	~15	Size (cm)
Effectiveness of notification	5/5	1/5	Subjective
Time to broadcast announcement			Time (ms)

Target Specifications

Metric	Marginal Range	Ideal Range	Units
Time from app start to navigation start	x ≤ 30	x ≤ 15	Time (s)
Customer Satisfaction	<i>x</i> ≥ 3/5	x ≥ 5/5	Subjective
Effective range of the beacon	<i>x</i> ≥ 6	x ≥ 10	Distance (m)
Battery Life of beacon	<i>x</i> ≥ 1	<i>x</i> ≥ 5	Years
Time to reprogram beacon locations	x ≤ 420	x ≤ 300	Time (s)
Cost per beacon	x ≤ 70	x ≤ 30	CAD\$
Beacon Weight	x ≤ 750	x ≤ 500	Weight (g)
Beacon Size	x ≤ 25	x ≤ 10	Size (cm)
Effectiveness of notification	x ≥ 4/5	x = 5/5	Subjective
Time to broadcast announcement	x ≤ 6000	x ≤ 5000	Time (ms)

Decision Matrix - App

Metrics:

 1) Time from app start to navigation start
 2) Customer Satisfaction
 5) Time to reprogram beacons
 9) Effectiveness of notification
 10) Time to broadcast announcement

Concepts: 1) Create android app from scratch 2) Cross-platform app from prebuilt frameworks 6) Create app using MIT App Builder 8) Auditory notifications 9) Haptic notifications

Арр										
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2	37%	5	4	4	5	3				
5	10%	3	3	3	2	3				
9	22%	4	3	4	5	3				
10	4%	4	3	3	4	5				
Score		4.54	3.64	3.86	3.85	3.62				

Decision Matrix - Beacon

Metrics:
2) Customer Satisfaction
3) Effective range
4) Battery life
5) Time to reprogram
6) Cost
7) Weight
8) Maximum Dimensions

Concepts: 3) Wi-fi signals 4) Ultrasonic acoustic signals 5) IR signals 7) Bluetooth signals 14) Position vectors via triangulation 15) 3D Printed beacon housing

			Bea	acons			
Μ	W	3	4	5	7	14	15
2	26%	2	1	2	4	5	5
3	16%	5	2	2	4	5	4
4	18%	1	4	4	4	3	3
5	3%	1	5	5	5	2	4
6	21%	2	4	5	3	3	4
7	8%	2	5	5	5	3	2
8	8%	2	5	5	5	3	3
	Score	2.27	3.09	3.56	3.98	3.81	3.84

Concepts

App:

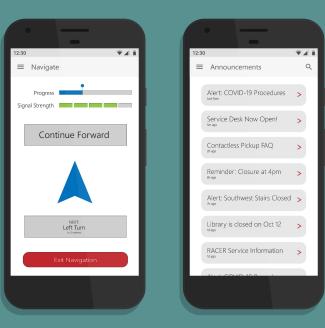
- Android app
- Haptic and/or Auditory Notifications
- A unique app or authentication process for employees to use for administrative tasks

Beacon:

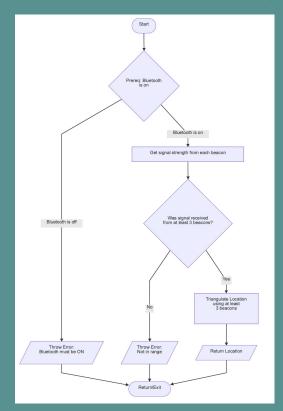
- Bluetooth Signals
 - Triangulation and displacement vectors
- 3D Printed PLA
- Mounted with screws

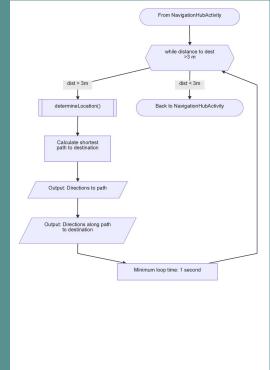
Software Prototype Development

- Using Android for higher-fidelity prototypes
 - Android is the final platform
 - Our team is already familiar with it
- Lower-fidelity prototypes are split into flowcharts and simulated screenshots
 - Screenshots for getting feedback from the client about the visual style and flow of the app
 - Flowcharts for validating the logical flow of the app

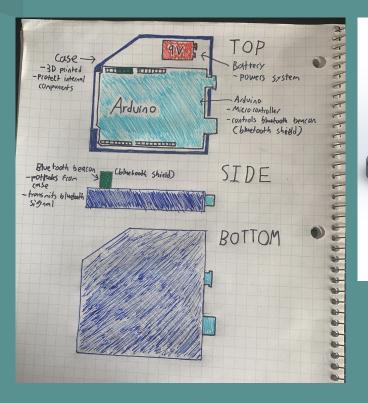


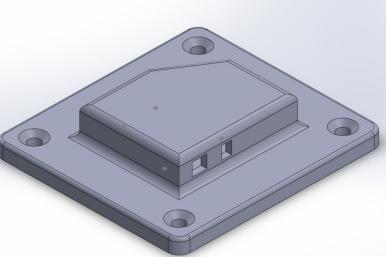
Software Prototype Development



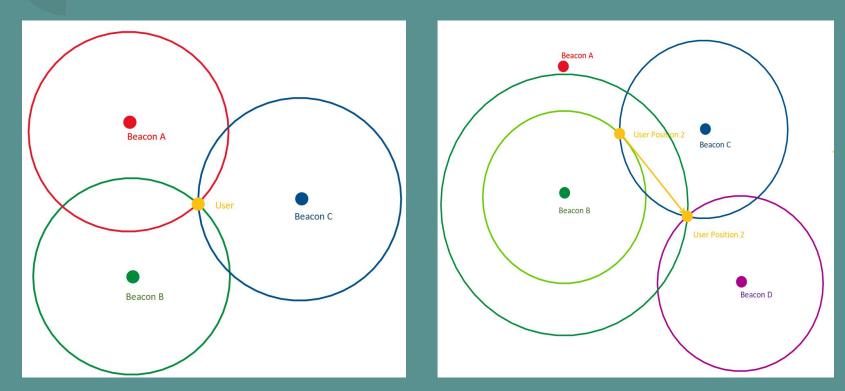


Physical Prototype Development





Tracking Position



Client Feedback

 From Client Meeting 1 our team received feedback on our initial ideas and gauged the clients needs which were outlined previously in this presentation

 During the Second Client Meeting the team had a plan set for our prototypes and layout of the system, Meghan was very happy with our progress so far

Feasibility Study

Technological

- Previous Knowledge in AndroidBluetooth is better then other signal forms

Economic

- A Budget of \$100 is enough for 4 beacons

Legal

Our project has no current or foreseeable legal issues

Organizational

- The due dates we are bounded by are achievable Our team will learn and use any necessary skills to forward the project

Scheduling

Our current strategies are working, but our team is willing to adapt if necessary

Bill of Materials

Notable Features:

- Shipping is free
- BOM is for 4 beacons
- 3D printed case is only free if PLA is used

Material	Location	Quantity	Unit Cost	Extended Cost
3D printed case	From Makerlab	4	\$ -	\$ -
Battery Clips	From Makerlab	4	\$ 1.00	\$ 4.00
AA Batteries	From Makerlab	16	\$ 0.60	\$ 9.60
M3 Screws	McMaster-Carr (93640A125)	16	\$ 0.19	\$ 3.04
M3 Heat Inserts	McMaster-Carr (94180A331)	16	\$ 0.14	\$ 2.24
MCU + Bluetooth	From Makerlab	4	\$ 17.00	\$ 68.00
Shipping			\$ -	\$ -
Subtotal				\$ 86.88
Taxes				\$ 11.29
Grand Total				\$ 98.17

THE END

Thank you for listening!