



Senior Design: Divide and Conquer 1.0

Group 6: BarkaRoo Pet Trainer Module

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Project Narrative

While discussing project ideas a discussion about pet care began after a cat attempted to knock over one of our team members' monitors. We all discussed our love of furry companions and how sad it is to see people forgetting to take care of their animals after the initial excitement goes away. We noted that this was especially true for small children as they do not comprehend the responsibilities associated with owning a pet. As this was being discussed a member came up with the brilliant idea of making a collar /harness with automated reminders triggering LEDs to notify the child or forgetful owner of their dog needing their attention, whether this be the dog likely needing to; go to the bathroom, be fed, be walked, or be given affection.

When looking up this idea we found there were plenty of activity trackers for pets (dogs especially); LINK AKC, PetPace, Whistle, and Fitbark to name a few of the biggest names in the market space at the time of our research. These competitive devices help to track the activity of your pet, alert you to when your dog might have got out and then help you to find them. They do this by monitoring your pet using a heart rate sensor and a GPS tracker. Although these products have great use cases we believe that they are missing important features that do not allow them to be used for helping forgetful owners and teaching children the value of responsibility with their pets. We also believe that we can have most of the same features as the previously mentioned competitors at the same price point but with extra use cases and features. We want our product to be a lightweight, cost effective, low power, relatively fast to notify, and feature filled product that offers more for the same price as compared to the competitors mentioned earlier.

Specifications

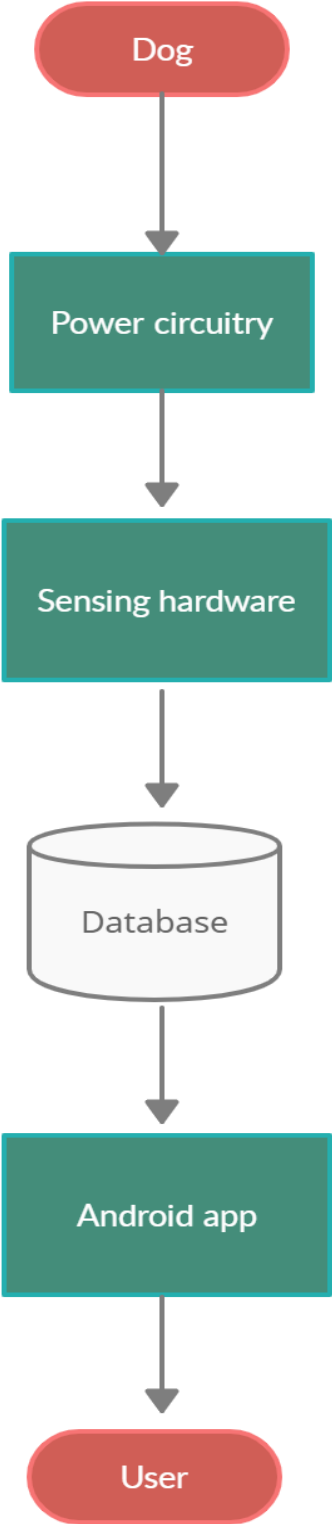
- Under a pound
- Small footprint for dog collar integration
- The cost of this device must be fairly cheap to obtain
- Last at least a week on a single charge
- Must allow the use of BLE(Bluetooth Low Energy) to utilize Geofence technology
- Seamless connection switch from BLE to WiFi
- Update the heart rate at least every 5 seconds
- Waterproof / dustproof
- LEDs should be visible around a corner at least 10 ft and 50 feet away if within eyesight
- LEDs need to be color blind friendly
- RTC should lose less than 10 seconds a day
- GPS accurate to under 10 meters
- Have a medium distance option for tracking (medium = $1\text{km} < x < 10\text{km}$)
- Software database populated by common AKC(American Kennel Club) potty times based on weight and age of dog
- Mobile application must be able to send notification for:
 - Suggested feed time
 - Suggested potty times
 - Dog has left the designated Geofenced area within 5 seconds
- Able to tell if a dog has slipped his collar
- Able to see if a dog is left in a car (heat deaths)
- A way to notify if the dog has been fed
- Microphone and speaker

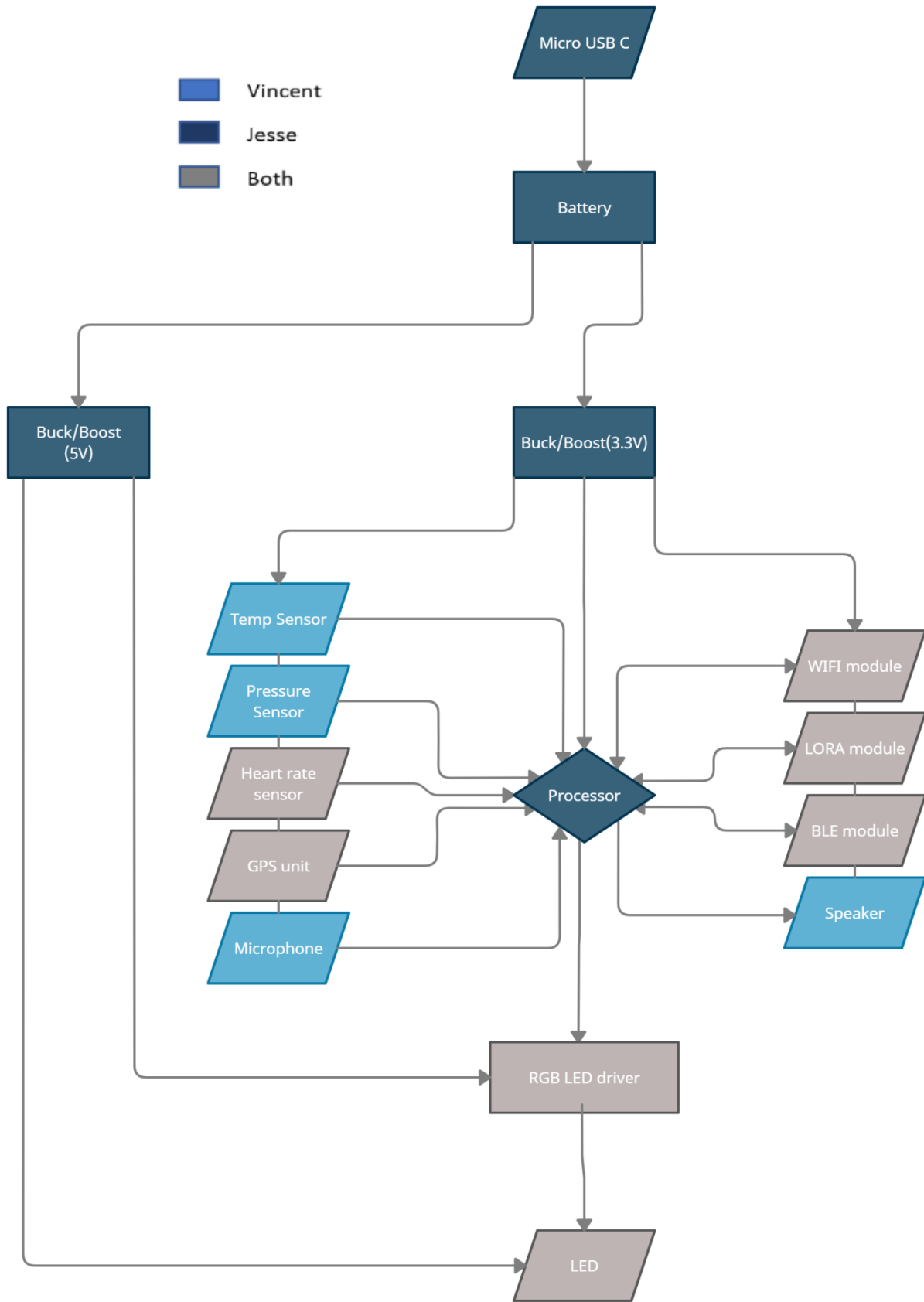
House of Quality

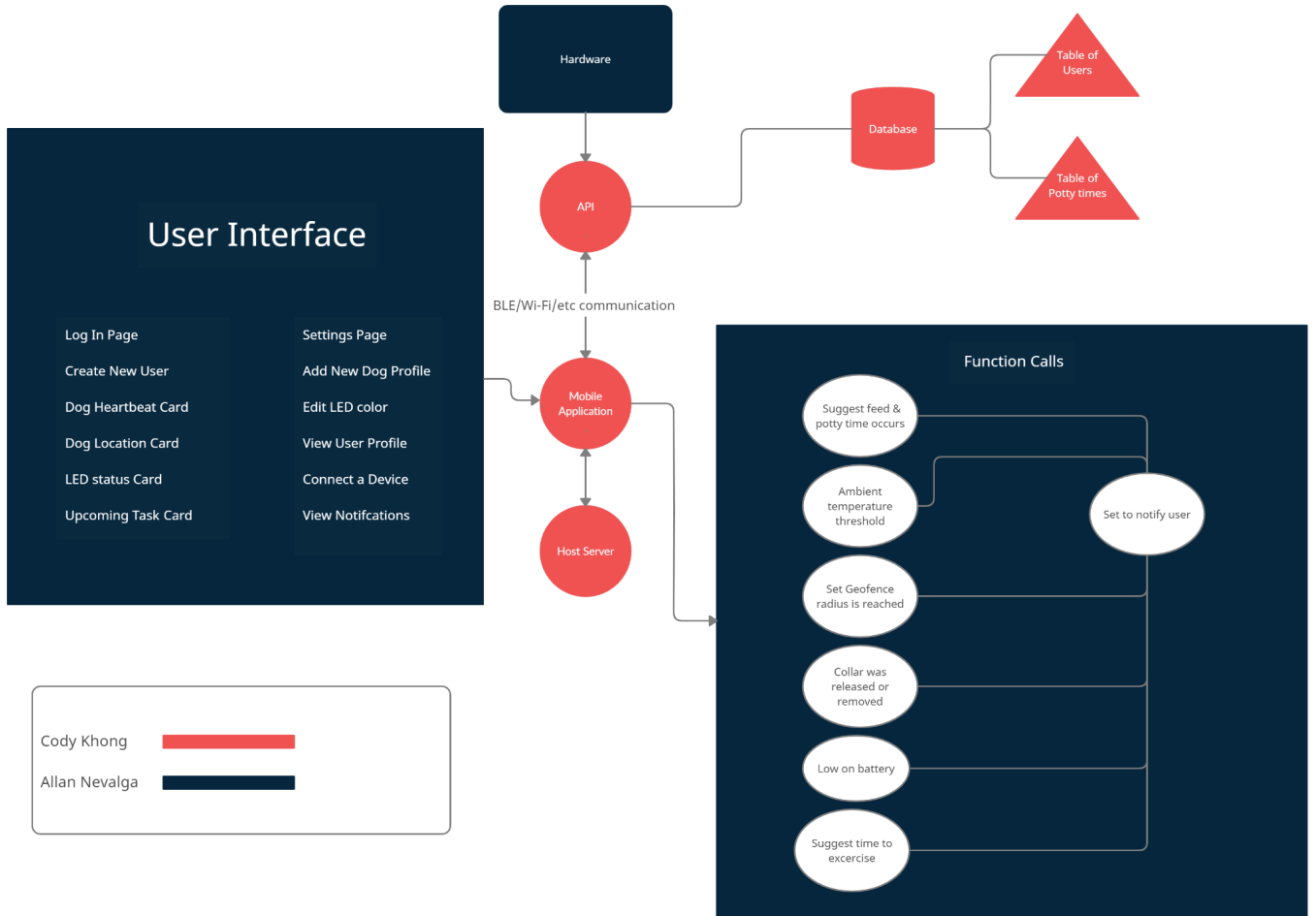
Correlation Legends		Polarity Legends	
++	Strong Positive	↑	Positive Polarity
+	Positive	↓	Negative Polarity
-	Positive		
--	Negative Strong		

		Engineering Requirements					
		Power	Cost	Time	Dimensions	Location Accuracy	Transmission Speed
User Requirements	Cost	-	--	--	-	+	+
	Reliable Data Transmission	++	+	+		+	++
	Connectivity	++	+	-	--		
	Visual Indicators	-	-	+			
	Range	++	+	++		++	+
	Mobile Application	-	-		-	-	+
Target Engineering Requirements		1 week battery life	< \$500	10 weeks	dog collar size	~ 200 meter radius	5-10second delay

Block Diagram







Estimated Budget And Financing***

Item	Quantity	Price	Availability
Microcontroller	1	~\$10.00 per unit	TBD
Custom PCB/Layout	5	~\$8.00 per unit	readily
Multipurpose LED	1**	~\$0.80 per unit	readily
Speakers	1**	~\$2.43 per unit	readily
Vinyl Collar	1	~\$12.45 per unit	readily
GPS module	1	~\$39.50 per unit	TBD
Heartbeat Sensor	1	TBD	TBD
Pressure Sensor	1**	~\$6.15 per unit	readily
Temp Sensor	1**	~\$1.35 per unit	readily
BLE module	1	TBD*	readily
Wi-Fi module	1	TBD*	readily
Lithium Batteries	2	~\$9.99 per unit	readily
Dev Boards	9	~\$10.00 per unit	readily
Server	1	~\$100.00	TBD
Shipping Cost	10	~\$5 per unit	-
Microphone	1	~\$10.00 per unit	
Misc. (Wires, Connectors, etc.)	-	~\$20.00	-
Misc. Components (Resistor, Caps, etc)	-	~\$20.00	-
Total	-	\$442.68	-

**Quantity needed is subject to change

*Awaiting part approval before estimating price. (Some microcontrollers have bundled Wi-Fi and BLE modules.)

Initial Project Milestones



Citations and References

- Past Senior Design Paper

<https://www.ece.ucf.edu/seniordesign/fa2015sp2016/g33/Senior%20Design%20%20Final%20Paper.pdf>

- Bluetooth Low Energy

<https://help.locusmap.eu/topic/is-gps-over-bluetooth-low-energy-le-bt-4-0-supported>

- Similar Products

https://www.amazon.com/LINK-AKC-Smart-Dog-Collar/dp/B01M5JZ1VO/ref=as_li_ss_tl?ie=UTF8&linkCode=ll1&tag=caninejournal-20&linkId=6945ab19ddcca7c46924e117ddb93d50&language=en_US

https://www.amazon.com/PetPace-Smart-Collar-Large/dp/B01N5YFHBW//ref=as_li_ss_tl?ie=UTF8&linkCode=ll1&tag=caninejournal-20&linkId=610fec344692de7b7091ccf2c35480af

<https://www.whistle.com/>

<https://technobark.com/best-dog-fitness-trackers-this-year/>

- Hardware References

<https://www.mouser.com/ProductDetail/Espressif-Systems/ESP32-C3FN4?qs=iLbezKQl%252BsjnhgSmJXMnMQ%3D%3D>

<https://www.digikey.com/en/products/detail/espressif-systems/ESP32-S2/11613132>

<https://www.digikey.com/en/products/detail/espressif-systems/ESP32-S2-WROOM-I/11613141>

<https://www.digikey.com/en/products/detail/espressif-systems/ESP32-S2-WROVER-I/11613134>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6316215/>

<https://learn.adafruit.com/whistle-dog-activity-monitor-teardown>

- Software References

<https://developer.android.com/training/basics/firstapp/creating-project>

<https://www.mysql.com/products/workbench/>

<https://www.mongodb.com/>