Initial Project and Group Identification Document

Divide and Conquer

Smart Harness for canine that will connect to a phone app that has the ability to read heart rate, record temperature, record steps and pinpoint location through GPS.

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1.0 Project Narrative

One problem with owning a dog is not having easily accessible health and fitness information that concerns your pet. In the age of smart technology it seems our four-legged friends have been forgotten. Knowing when your pet may be ill or helping keep him at a healthy weight is important, and a device that can assist in these tasks can be powerful for any dog owner. The motivation for this design is to provide a tool for your basic consumer that has a concern for their pet's fitness and well being as well as the professional that needs an easy and effective way to record a dog's health information.

To start, this harness will be adjustable, lightweight, portable, waterproof and very comfortable so that the dog can wear it around its body at all times without the need to constantly remove it. This could possibly eliminate the need for a collar. It should also be low cost and easy to use as this is meant for all consumers. Many features that would be included are similar to a human fitness device. It would contain a heart rate monitor using a sensor placed on the dogs chest. The device will also contain an accelerometer to be used as a pedometer (step counter) so you can monitor the activity level of the dog throughout the day and even when you are away. There will also be a thermometer/sensor placed in the front armpit to take temperature readings. While these are not as accurate as the invasive rectal thermometer, they can be used as a supplemental information source. A GPS receiver will be implemented in the design to help do away with the invasive and painful microchipping, so as long as your dog is wearing his or her harness they can be located. The device will also contain Bluetooth capabilities for easy pairing with mobile devices.

The harness will also work in conjunction with a smartphone application. This application will be designed in such a way that the user will receive notifications when certain events occur. An example of this could be if a dog becomes ill. In the event that a dog begins to run a fever, an alert can be sent to the mobile device so that the owner can be aware that perhaps your pet requires a visit to the vet. Another feature that will be contained in the app is the ability to monitor your dog's activity level throughout the day. If a vet informs an owner that their dog is at an unhealthy weight, the user can input the dog's weight into the application and set up reminders to make sure that he or she is getting enough exercise. While the average consumer can get a lot of benefit out of this design, a veterinarian office could find many uses as well. If many dogs are kept under careful watch due to health concerns, having an alert system when the heart rate or temperature dips low could save a pup's life.

Whether this is for the housewife that cares dearly about their furry family member, the child who is caring for their first pet, or the veterinarian that is caring for a handful of puppies, the object of this smart harness is to provide a tool that anyone can use to keep track of their dog's health and have a sense of reassurance that the dog's health is well.

2.0 Requirement Specifications.

2.1 Hardware Requirements

- Microcontroller
- GPS receiver to track location
- Compact sensors to detect heart rate and temperature
- Total weight < 2.5 Lbs
- Accelerometer to record steps
- Bluetooth connectivity to mobile device
- Waterproof housing for electronics
- Battery/Power Supply
- Safe for all dogs

2.2 Software Requirements

- User friendly
- Notifications for specific events (high temperature)
- Record steps (pedometer)
- Activity/Weight tracker
- Bluetooth connectivity to hardware
- Receive data from user and harness
- Display data from sensors
- Access location through use of GPS
- Access/display heart rate
- Temperature reader
- Temperature records
- Pet health history records
- Android device compatible
- Java SE

2.3 Harness Requirements

- Durable
- Adjustable (fits dogs of many sizes)
- Lightweight, breathable fabrics
- Water resistant fabric
- Comfortable
- Low Cost

2.4 Project Constraints

- Uncontrollable factors for dog: We do not yet know the dog which we will test the harness on which means we are unsure of the temperament of the dog, the size, the hair type, the hair length, the breed. We can have all the specifications but if we do not narrow down the details to the correct breed type if not all breed types, then we might have an issue when testing on the dog.
- Correct requirements: We need to get with the correct professionals to better understand what a consumer may need for a useful product. For example, we do not want to include features on the harness that would not be useful in analyzing a dog's health. Coordinating with a professional to give us that one on one advice may present some issues.

3.0 House of Quality

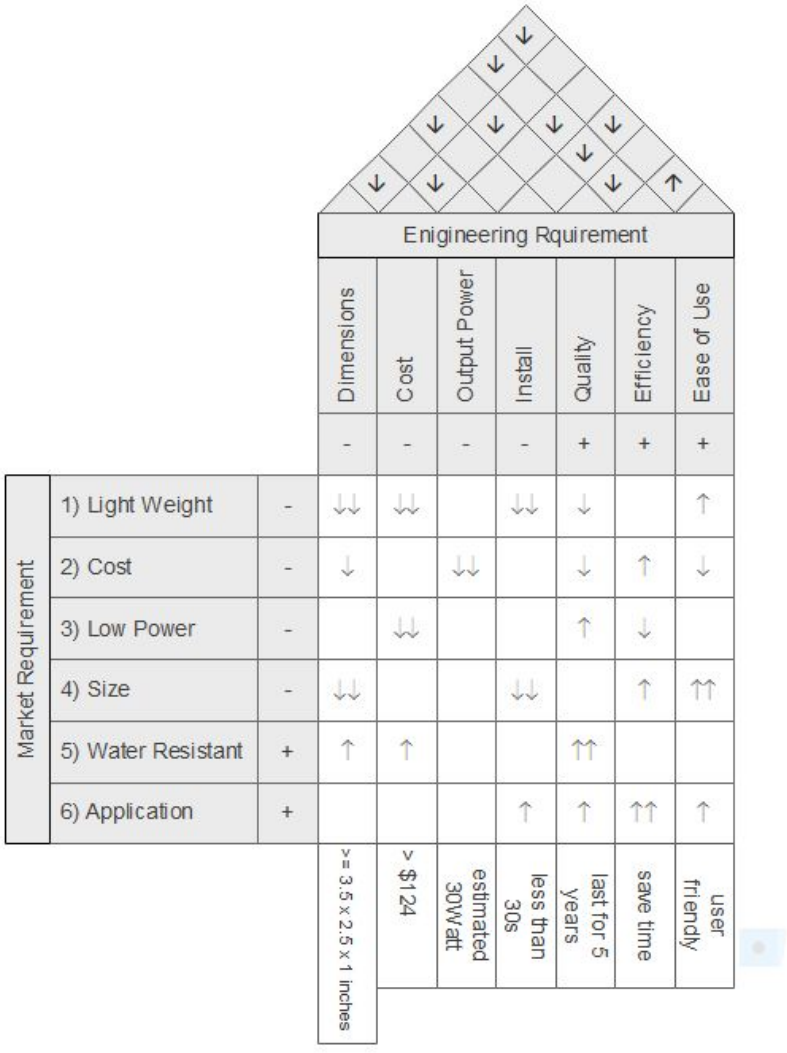

Figure 3. The complete House of Quality for the dog smart Harness.

3.1 Notations

- + Positive polarity
- - Negative polarity
- ↑ Positive correlation
- ↑↑ Strong positive correlation
- ↓↓ Strong negative correlation
- ↓ Negative correlation

4.0 Block Diagram.

4.1 Hardware Diagram

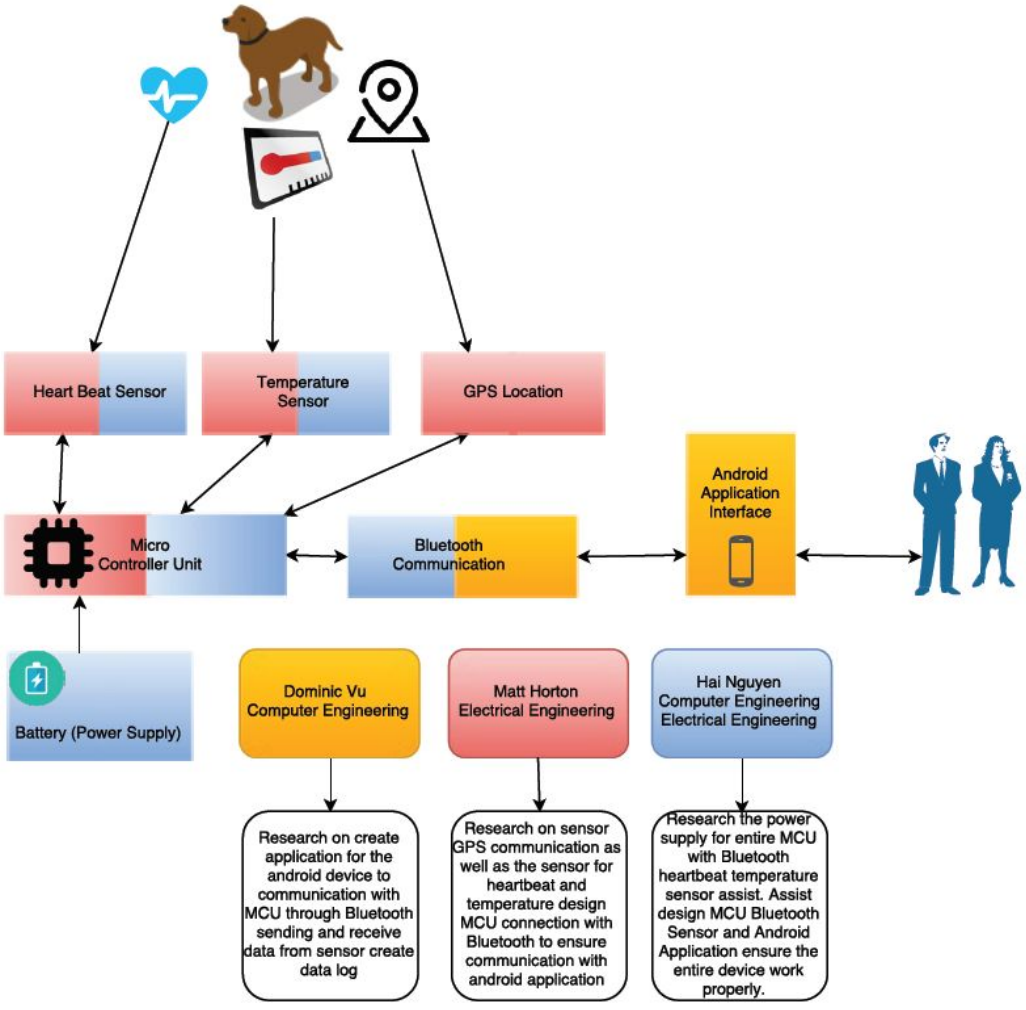

Figure 4.1 Completion of Hardware Diagram.

4.2 Software Diagram

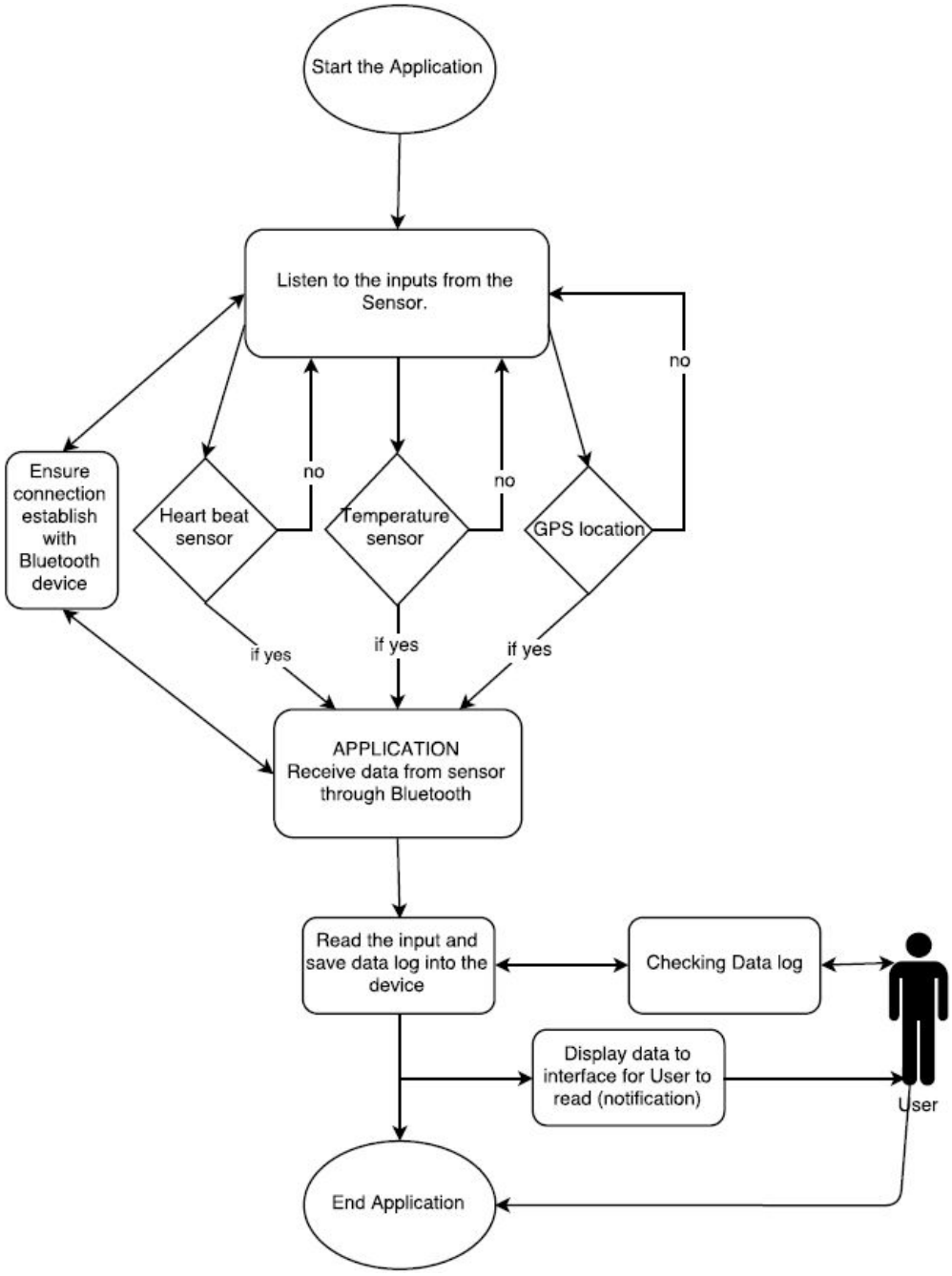

Figure 4.2 Completion of Software Diagram.

6.0 Estimated Project Budget and Financing

Budget					
Part Name	Description	Vendor	PPU	Quantity	Total
Dog Harness	Tactical water resistant harness with handle	OneTigris	$28.59	1	$28.59
Android Studios	The Official IDE for Android	Android	FREE	1	FREE
Microcontroller	Uno R3 Microcontroller	Arduino	$16.06	3	$48.18
GPS Sensor	GPS Sensor Module component	Flora	$48.92	3	$146.76
Power Supply	Isolated Switching Power Supply Converter Module	Eshion	$5.80	3	$17.4
Bluetooth Chip	Microchip RN42-I/RM Bluetooth Chip 2.1	Microchip	$17.53	3	$52.59
Accelerometer	Accelerometer Module for Arduino	Industry	$7.30	3	$21.9
Temp Monitor	Temperature and Humidity Measure Sensor	MakerFocus	$9.99	3	$29.97
Heart Monitor	Pulse / Heart Rate Sensor Module for Adruino	HobbyKing	$8.03	3	$24.09
					$369.48

7.0 Project Milestones

Senior Design I	Tasks	Start	Status
	Group Formation	05/28/2017	Completed
	Collaborate Ideas	05/28/2017	Completed
	Divide & Conquer RD	06/02/2017	In Progress
	Finalize Idea with professor	06/06/2017	In Progress
	MILESTONE 1 -- Finalize Idea		
	Review notes from professor's advice	06/07/2017	Pending
	Divide & Conquer Final Documentation	06/09/2017	Pending
	MILESTONE 2 -- Full Requirements & Specifications		
	Research, document and design PCB	06/16/2017	Pending
	Research, document and design Microcontroller	06/16/2017	Pending
	Research, document and design Heart sensors	06/16/2017	Pending
	Research, document and design Accelerometer	06/23/2017	Pending
	Research, document and design Harness	06/23/2017	Pending
	Research, document and design pedometer	06/23/2017	Pending
	Research, document and design compact sensors	06/23/2017	Pending
	Research, document and design dog anatomy	06/30/2017	Pending
	Research, document and design Bluetooth	06/30/2017	Pending
	Research, document and design Phone Application	06/30/2017	Pending
	Senior Design I Documentation RD (60p)	07/07/2017	Pending
	Senior Design I Documentation RD grade review	07/14/2017	Pending
	Senior Design I Documentation RD Adjustments	07/14/2017	Pending
	Senior Design I Documentation RD (100p)	07/21/2017	Pending
	Senior Design I Documentation RD grade review	07/28/2017	Pending
	Senior Design I Documentation RD Adjustments	07/28/2017	Pending
	Senior Design I Final Documentation	08/01/2017	Pending
	MILESTONE 3 -- Research & Design Phase Complete		
Senior Design II			
	Build Prototype	08/21/2017	Pending
	Testing	TBA	Pending
	Redesign	TBA	Pending
	Testing	TBA	Pending
	Redesign	TBA	Pending
	Testing	TBA	Pending
	Finalize	TBA	Pending
	Peer Presentation	TBA	Pending
	Final Report	TBA	Pending
	Final Presentation	TBA	Pending