

Shiver-Ring

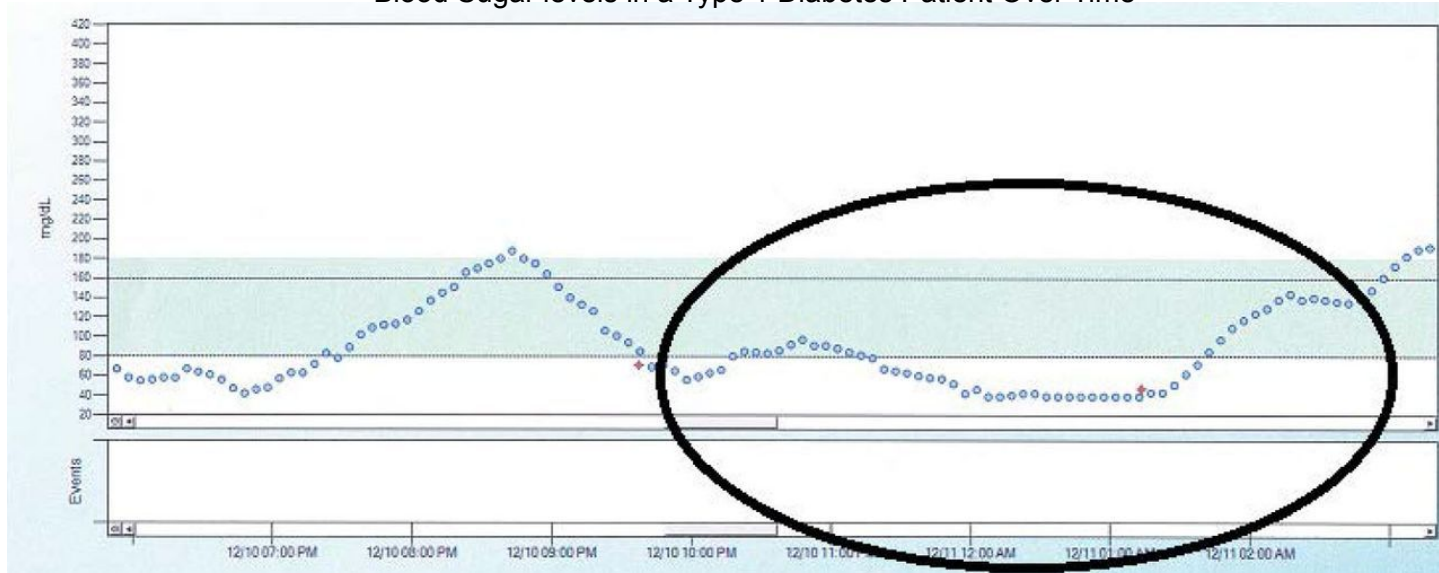
PDR Presentation for Team 2

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Problem Statement

When diabetic patients sleep their blood sugar levels can drop and result in hypoglycemic events, if the patient is unable to wake these events can go untreated and result in coma and even death.

Blood Sugar levels in a Type 1 Diabetes Patient Over Time



(Source: Unger J: Diabetes Management in Primary Care. 2nd ed. Philadelphia, Pa., Lippincott, Williams, and Wilkins, 2012.)

Preliminary System Specifications

- Sense in range 8-12 Hz
- Have an alarm go off when threshold met for 5 seconds
- Send a message to someone if the event is occurring and alarm has not been disabled within 10 seconds
- Wearable and comfortable wrist strap
- Our SDP budget is the limit to the price of our solution (\$500)
- 12 Hour battery life

Survey of Competing Solutions in Marketplace



Advantages:

- FDA Approved Class 3 medical device
- Non-Invasive
- No calibration required

Disadvantages:

- Expensive
- 10% failure rate
- Only alerts nearby users using a buzzer, no secondary alert system

Advantages:

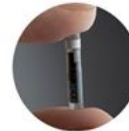
- 96% success rate
- user monitoring app
- data shared to family and health professionals

Disadvantages:

- Invasive
- Has to be replaced every 90 days
- Sends data every 5 minutes



90-day
Implantable
Sensor
subcutaneous



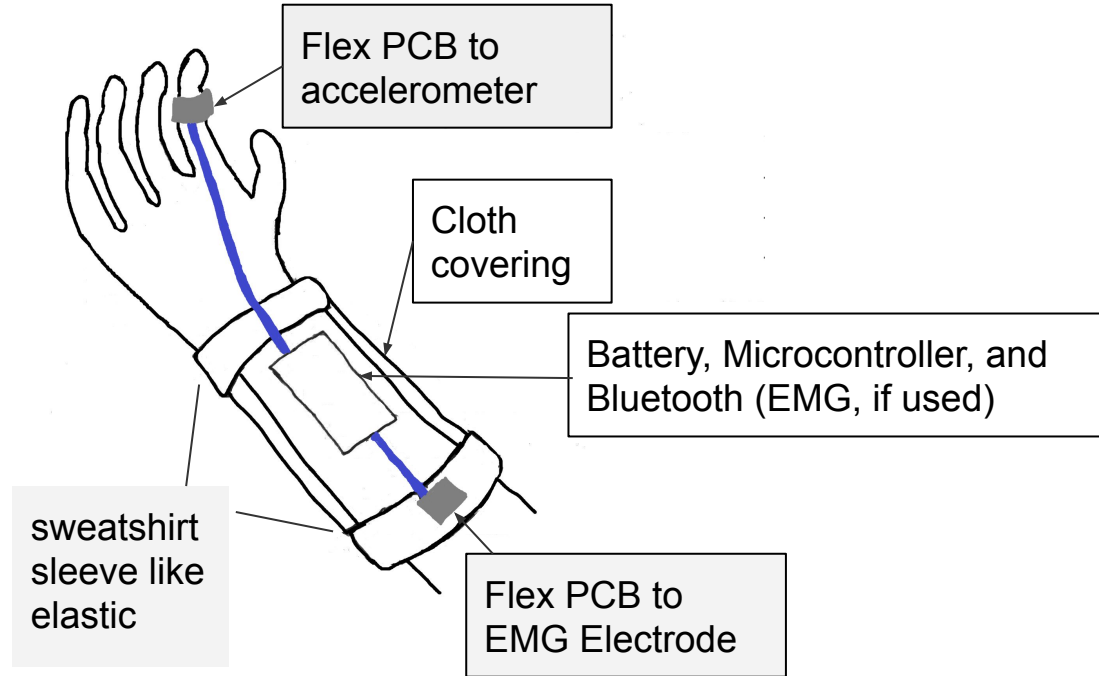
Removable
Transmitter
worn over skin



Mobile
Application

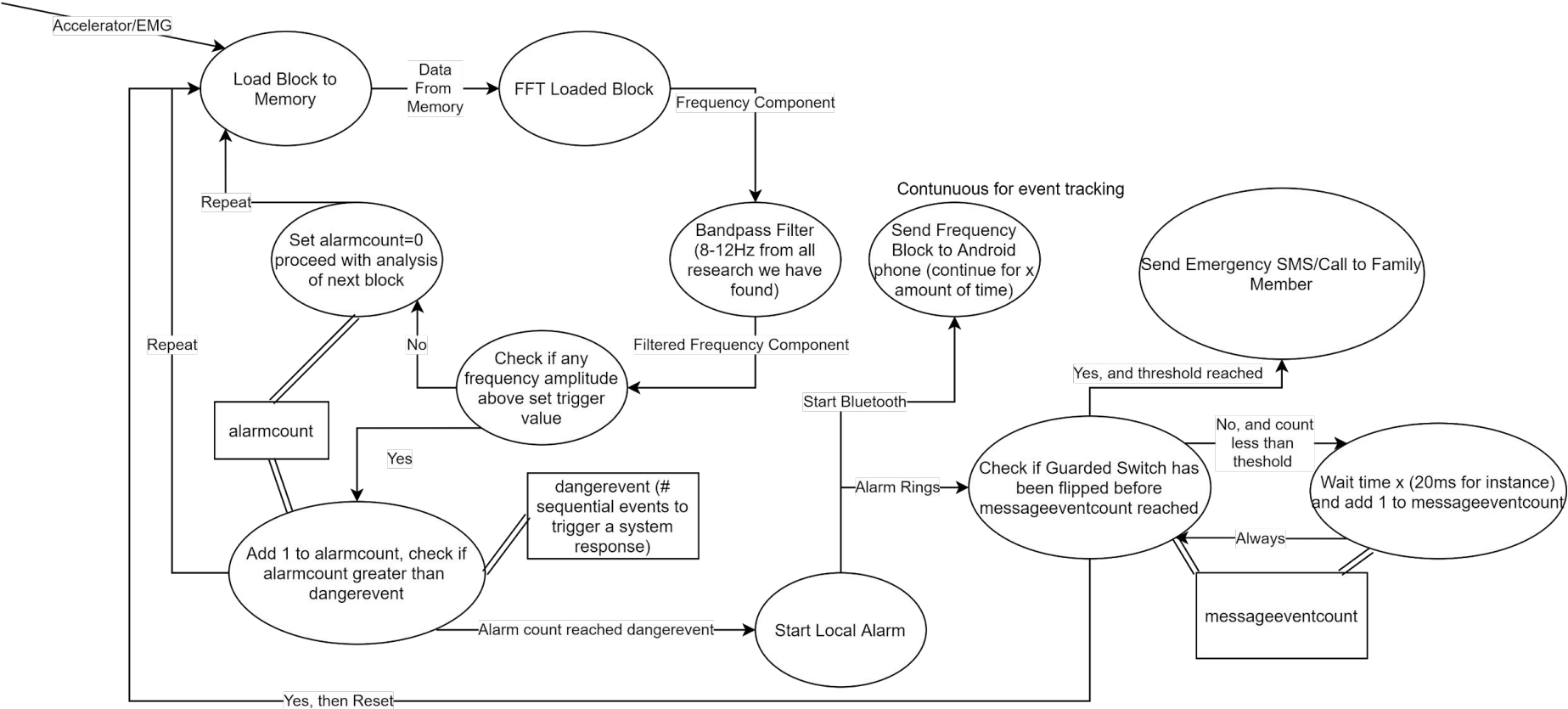


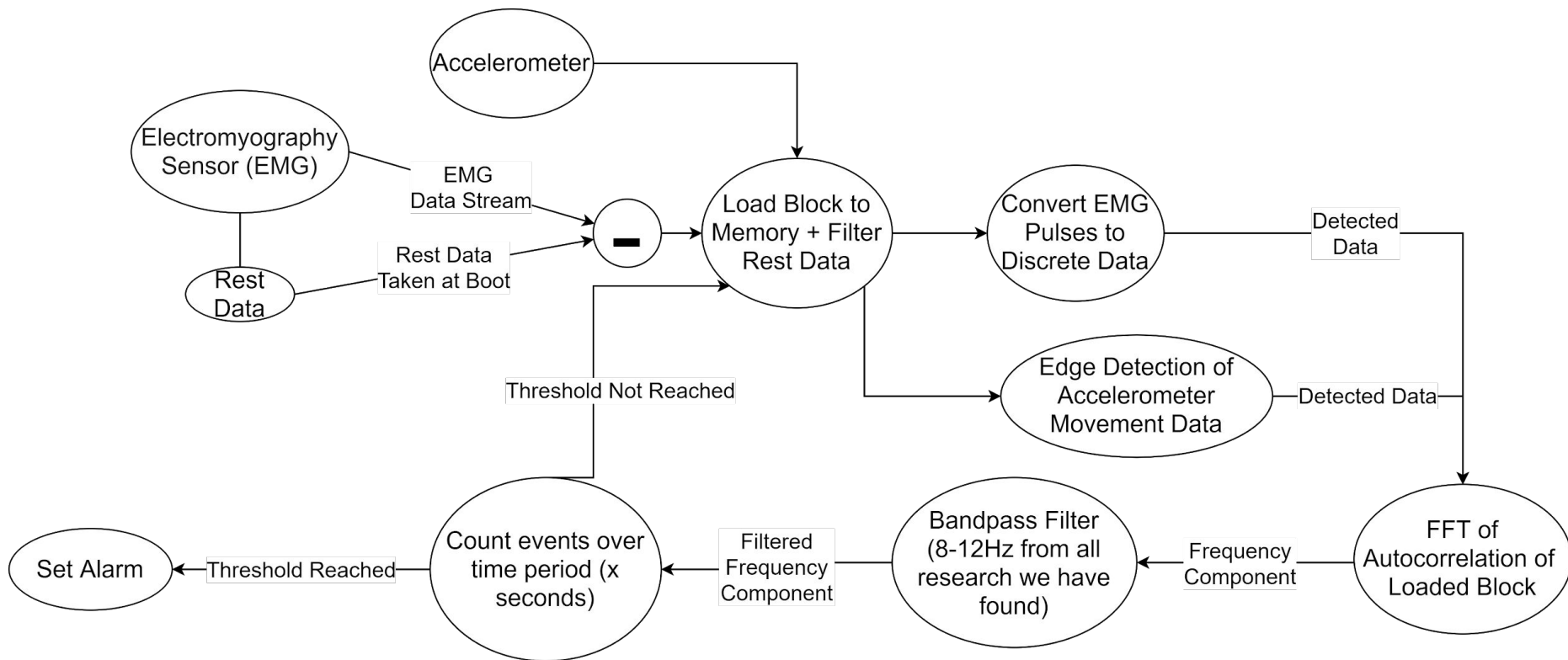
Design Alternatives/Ideas



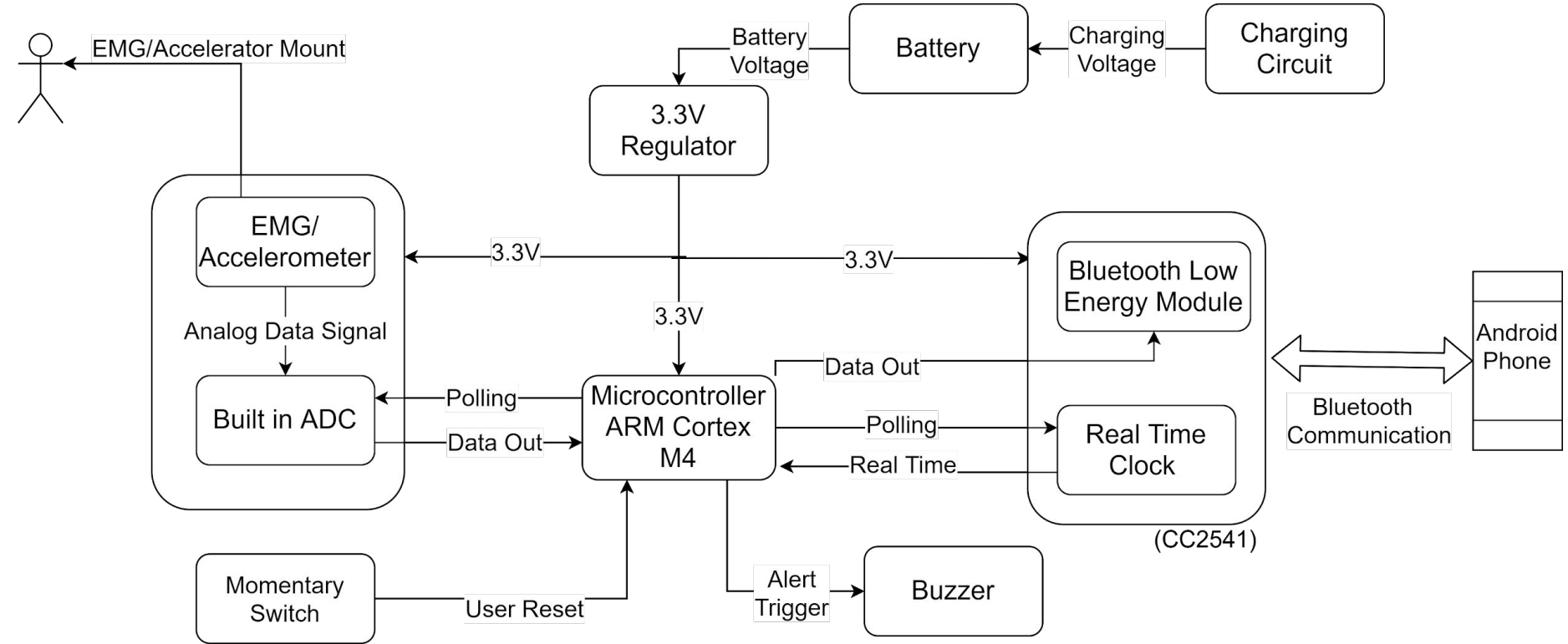
Preliminary Design

Overall Design:





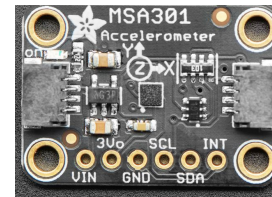
Significant Custom Hardware Design



Proposed MDR Deliverables

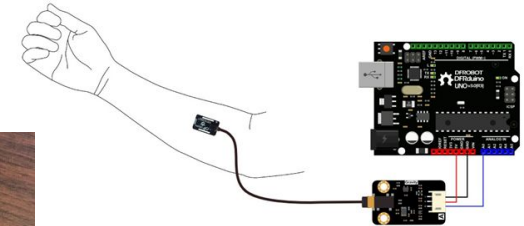
- A survey of sensors:

- Oymotion Analog EMG
 - needs electrodes
 - wet and dry electrodes
 - conductive textile electrode
- Triple Axis Accelerometer MPU6050



- Tests to report back on:

- determine the better sensor
- location tests to get the best signal for EMG
- signal processing in MATLAB or similar
- Android app (only calling functionality, no connectivity with the rest of the project yet)
- Breadboard prototype



Cost Break Down

Part	Number	Price Each	Price	Link to Part
Oymotion Analog EMG	1	\$38	\$38	link
Triple Axis Accelerometer MPU6050	3	\$10	\$30	link
Arm Cortex M4	2	\$14	\$28	link
M4 development Board	2	\$28	\$56	link
Flexible Custom Board	1	\$40	\$40	link
Bluetooth Low Energy 4.0 TI CC2540	2	\$9	\$18	link
3,600mah Li-on Battery	1	\$14	\$14	
Alarm & Switch	1	\$5	\$5	
Housing and Band Material		\$40	\$40	
Shipping Costs		\$30	\$30	
Total			\$299	

Project Management - Administrative and Technical

- Connor Loughman - PCB design, App Dev, Web Service
- Adam Maciaszek - Budget Management, Algorithm/Embedded, Web Service
- Michael Burton - Embedded + Security, Project Co-Manager (Short-Term), Web Service
- John Murray - Communication Networking, App Dev, Project Co-Manager (Long-Term)

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