ANTIFREEZE

DETECTING FREEZING OF GAIT

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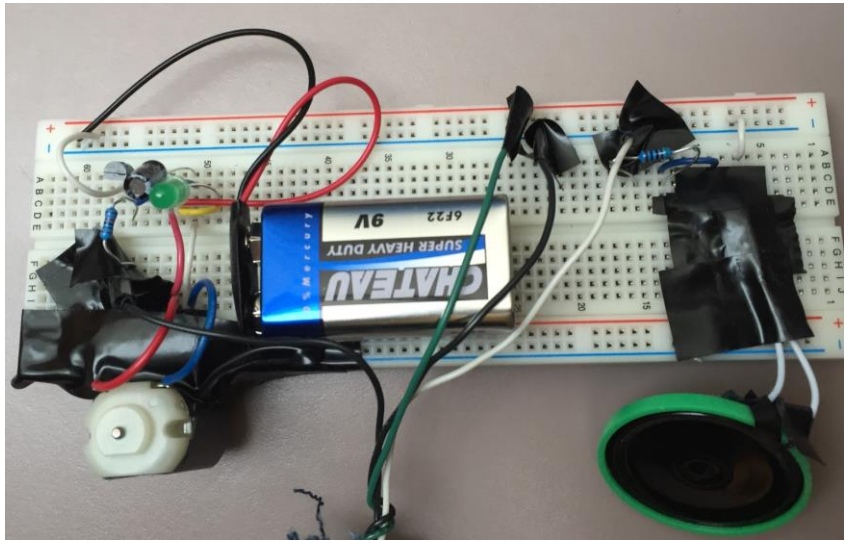
BME 261

BACKGROUND

- Parkinson's Disease: nerve degenerative disorder
- Freezing of gait: impairs mobility & independence

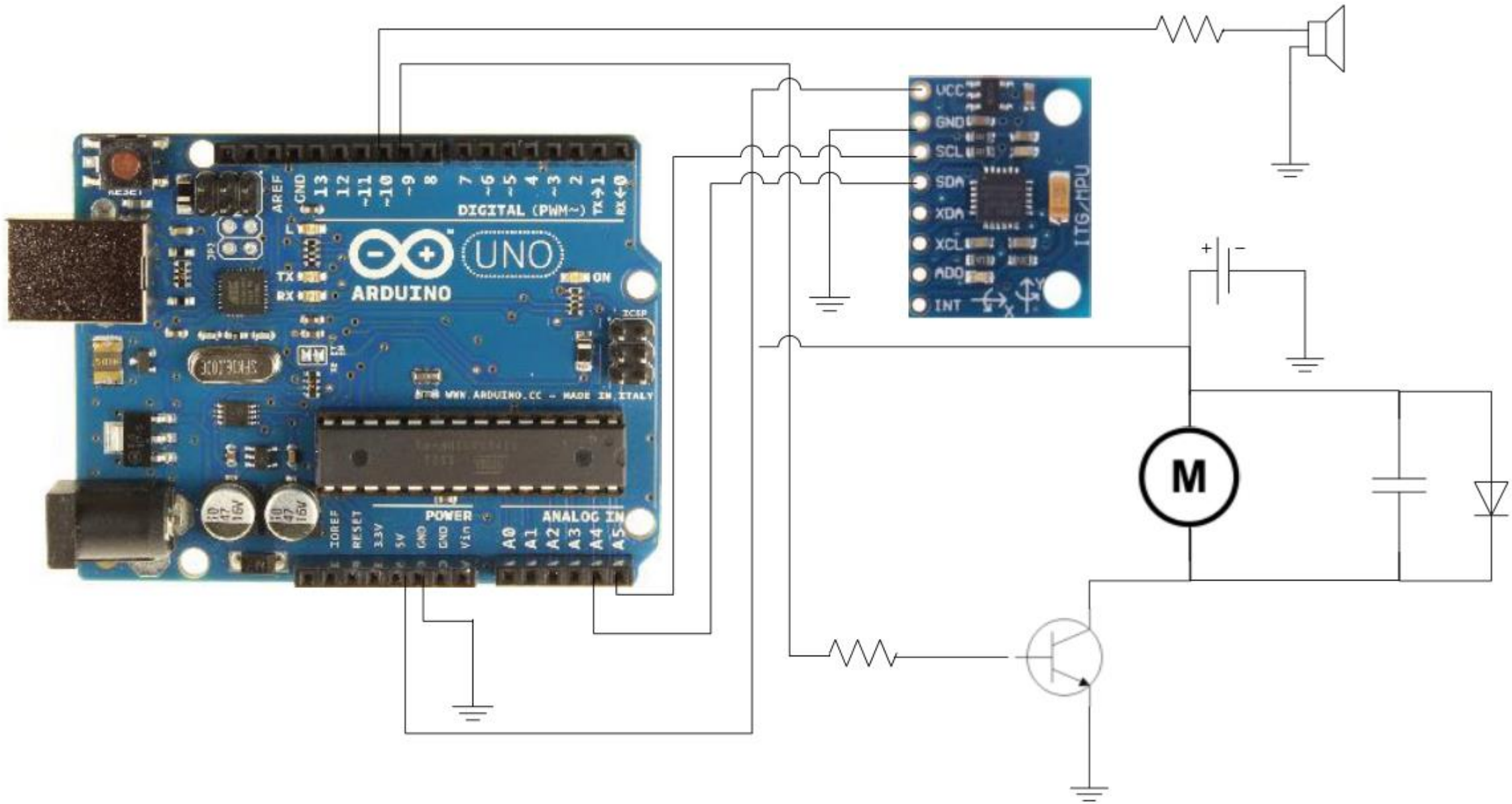
DESIGN PART I: PHYSICAL

- Sleeve with adjustable straps
- Positioning of circuit components
- Fabric wire sheath



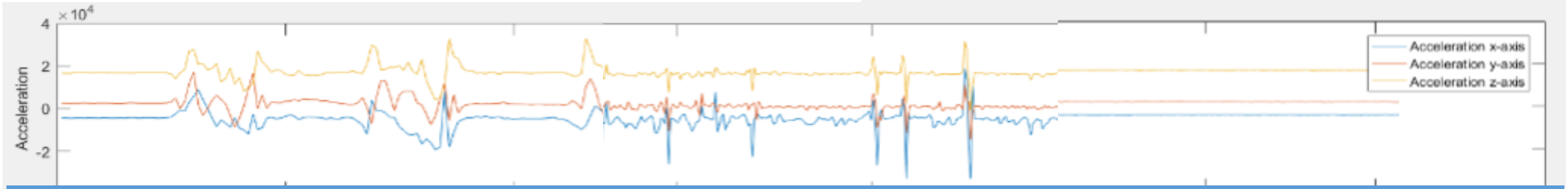
FRONT VIEW

1. Buzzer
2. Sleeve
3. Strap
4. Tube

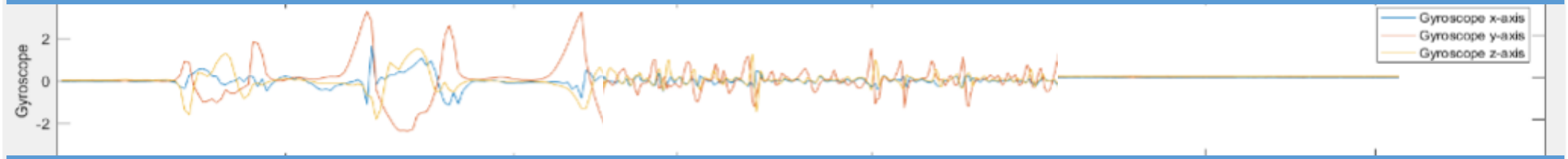

UNO
ARDUINO
DIGITAL (PWM~)
POWER
ANALOG IN
VCC
GND
SCL
SDA
XDA
XCL
ADO
INT
ITG/MPU
M

DESIGN PART II: SIGNAL PROCESSING

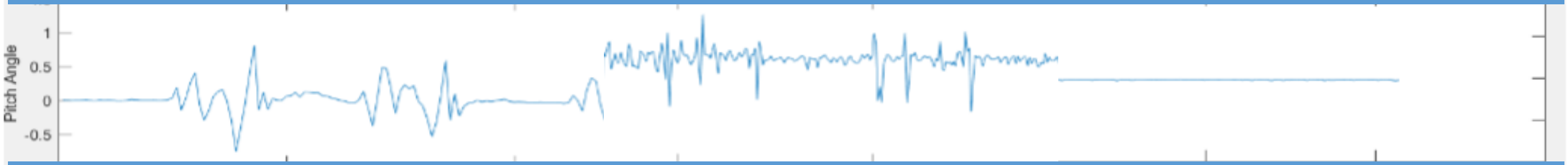
WALKING **FREEZING** **STOPPING**



What signal did we look at? → **GYROSCOPE Y**



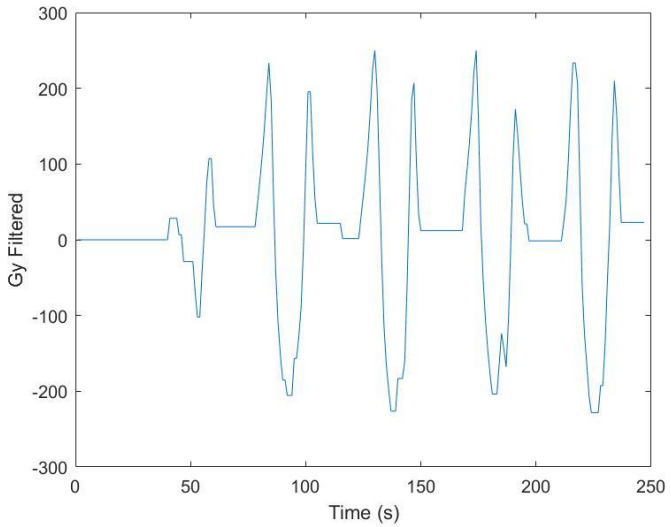
What features did we analyse? → **AMPLITUDE AND PERIOD**



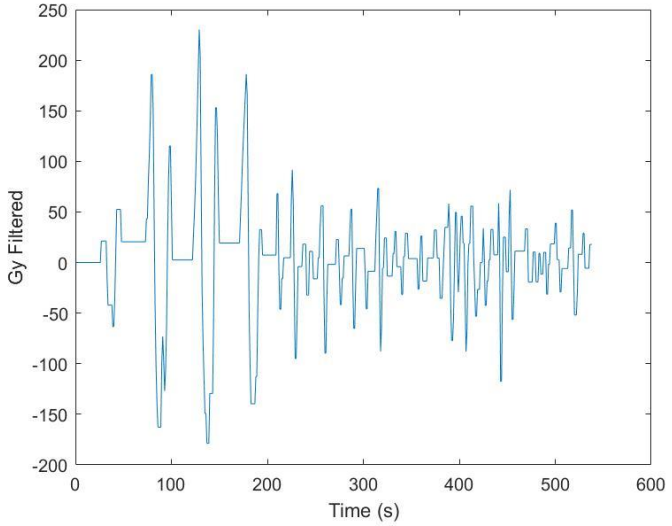
Could we have picked alternative signals? → **SURE!**

DESIGN PART II: SIGNAL PROCESSING

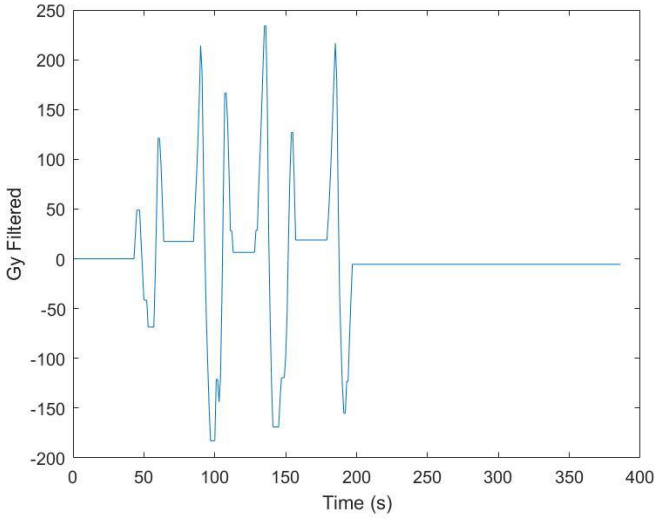
WALKING



FREEZING



STOPPING



- **Filtering:** get rid of noise…by making it all equal to 0
- **Pattern recognition:** threshold for period & amplitude of 1 flux

HOW DO WE KNOW IT WORKS?

- Tested against multiple data sets
- Walking (x10)
- Freezing (x10)
- Stopping (x10)

- Dual feature analysis → amplitude & period

DEMONSTRATION

...it actually works!

ANALYSIS

ALGORITHM

- Consistent performance with testing participant
- However, everyone walks differently
- Hardcoded threshold values may fail for other patients

PHYSICAL DESIGN

- Snug & adjustable to different leg sizes
- Does not perform as well over loose-fitting clothing (slips)

THANK YOU!

QUESTIONS?

REFERENCES

- Rohrseitz, N. (2016). Beyond Parkinson's: Medium Magazine. https://medium.com/the-future-beyond/beyond-parkinson-s-acdbe5c521fb#.n4rutt2jn