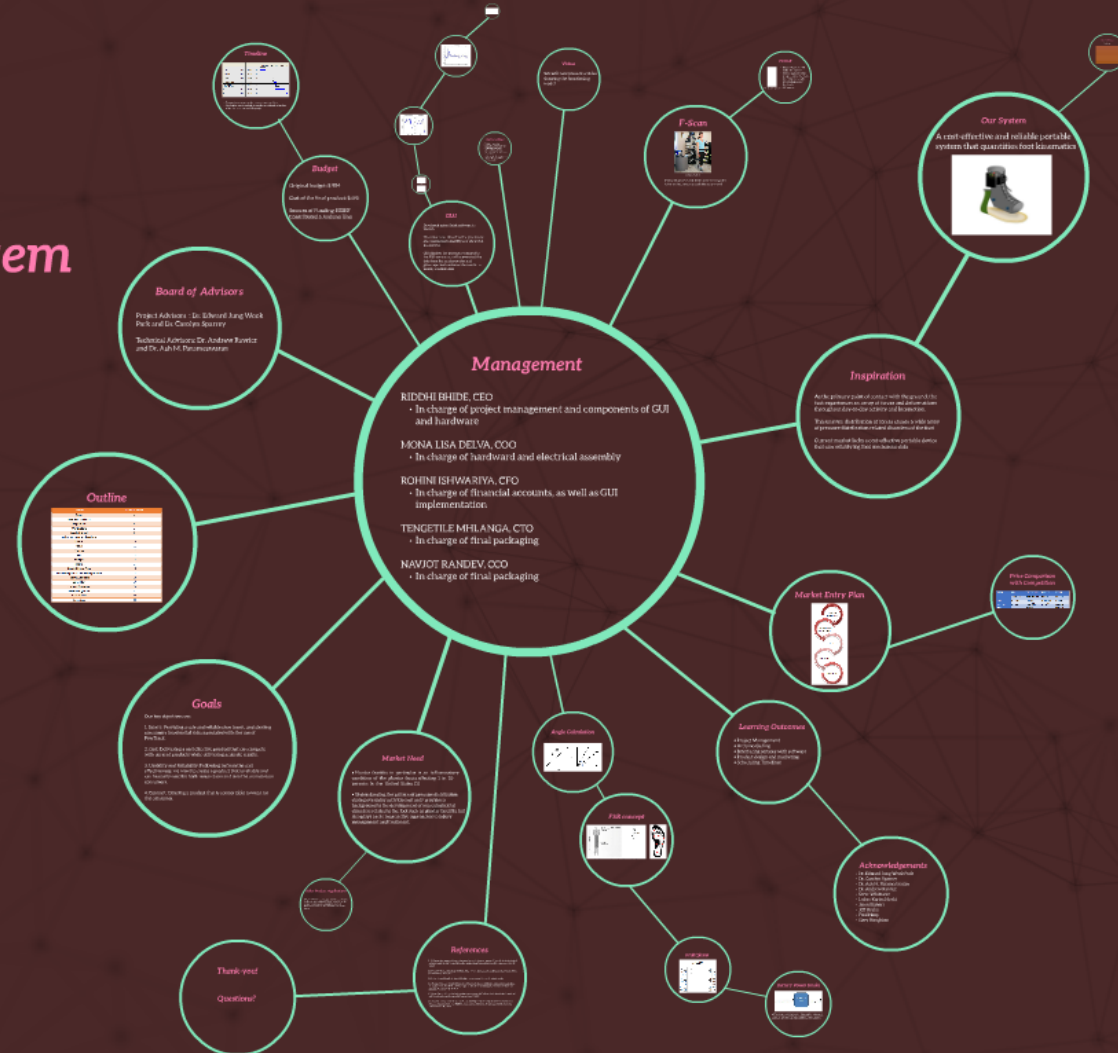


# PresTrack

## Plantar Foot Pressure Analysis System

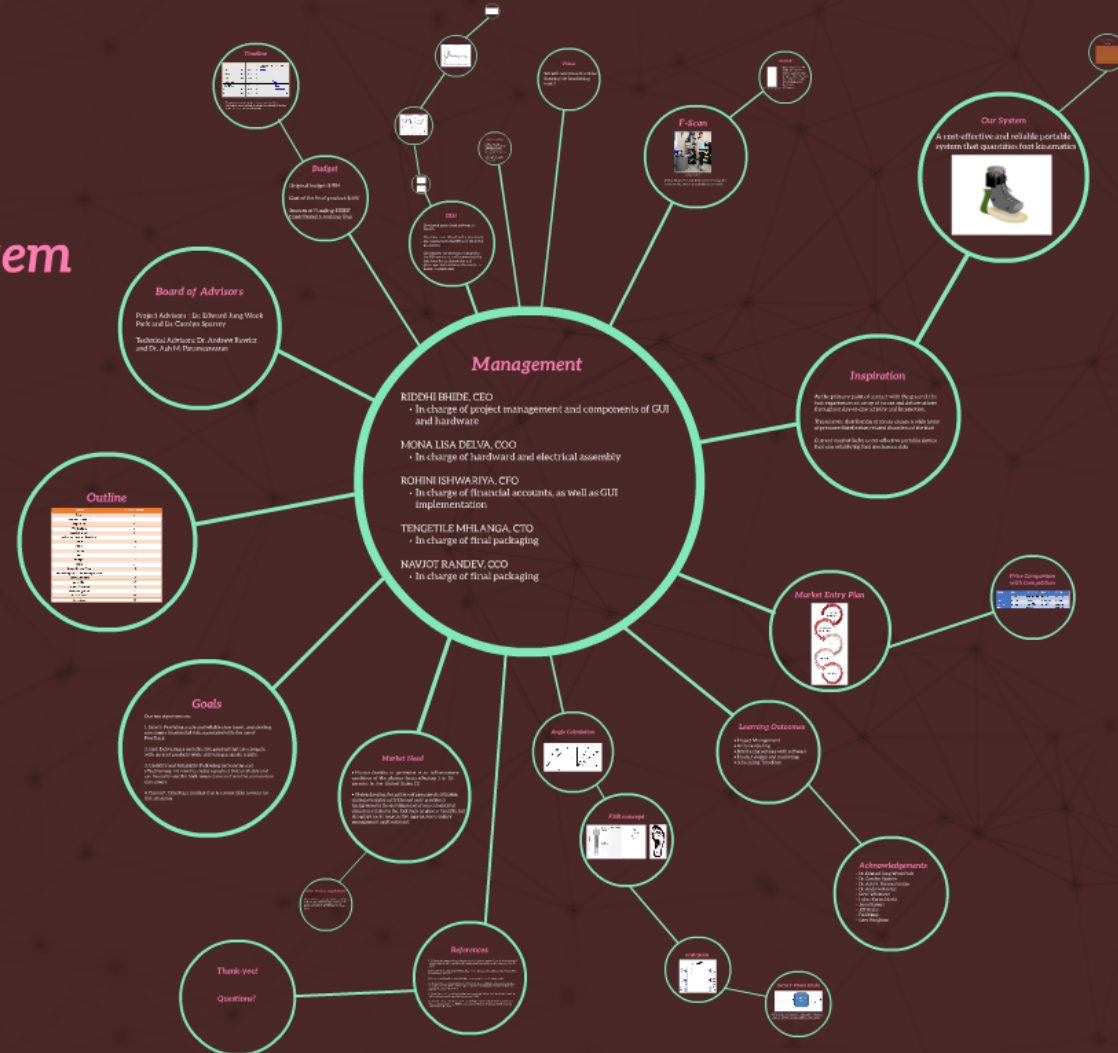
April 16, 2014  
Group 14



# PresTrack

## Plantar Foot Pressure Analysis System

April 16, 2014  
Group 14



# Management

RIDDHI BHIDE, CEO

- In charge of project management and components of GUI and hardware

MONA LISA DELVA, COO

- In charge of hardware and electrical assembly

ROHINI ISHWARIYA, CFO

- In charge of financial accounts, as well as GUI implementation

TENGETILE MHLANGA, CTO

- In charge of final packaging

NAVJOT RANDEV, CCO

- In charge of final packaging

# Outline

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# Goals

Our key objectives are:

1. **Safety:** Providing a safe and reliable shoe insert, and alerting consumers to potential risks associated with the use of PresTrack.
2. **Cost:** Delivering a cost effective product that can compete with current products while delivering accurate results.
3. **Usability and Reliability:** Following in from the cost effectiveness, we want to create a product that is reliable and can be easily used by both researchers and also the mainstream consumers.
4. **Comfort:** Offering a product that is comfortable to wear for the consumer.

# *Board of Advisors*

Project Advisors : Dr. Edward Jung Wook Park and Dr. Carolyn Sparrey

Technical Advisors: Dr. Andrew Rawicz and Dr. Ash M. Parameswaran



# *Inspiration*

As the primary point of contact with the ground, the foot experiences an array of forces and deformations throughout day-to-day activity and locomotion.

This uneven distribution of forces causes a wide array of pressure distribution related disorders of the foot

Current market lacks a cost-effective portable device that can reliably log foot mechanics data

## *Our System*

A cost-effective and reliable portable system that quantifies foot kinematics





# *Current Design*

## Prototype 1



## *Market Need*

- Plantar fasciitis in particular is an inflammatory condition of the plantar fascia affecting 1 in 10 persons in the United States. [1]
- Understanding the pattern of pressure distribution during everyday activities not only provides a background to the development of musculoskeletal disorders related to the foot such as plantar fasciitis, but also plays a role in proactive approaches to injury management and treatment.

## *Other Product Applications*

We can generalize our product so that not only does it aid in early diagnosis of Plantar Fasciitis, but also an array of various foot conditions that need quantified data of pressure distribution and ankle angles

# F-Scan



F-Scan system [2]

- Very expensive and limits user to computer (wireless features are available as add-ons)

# PEDAR



Pedar's in-shoe system [3]

- Expensive and is still bulky for its price
- System operates with straight connection to the PC and also via radio signal using inbuilt Bluetooth
- 256 sensors



## *Videos*

We will now present a video showing the functioning model



# GUI

Developed using Guide software in Matlab

User interface utilised by the physicians and reseraches to identify any abnormal parameters

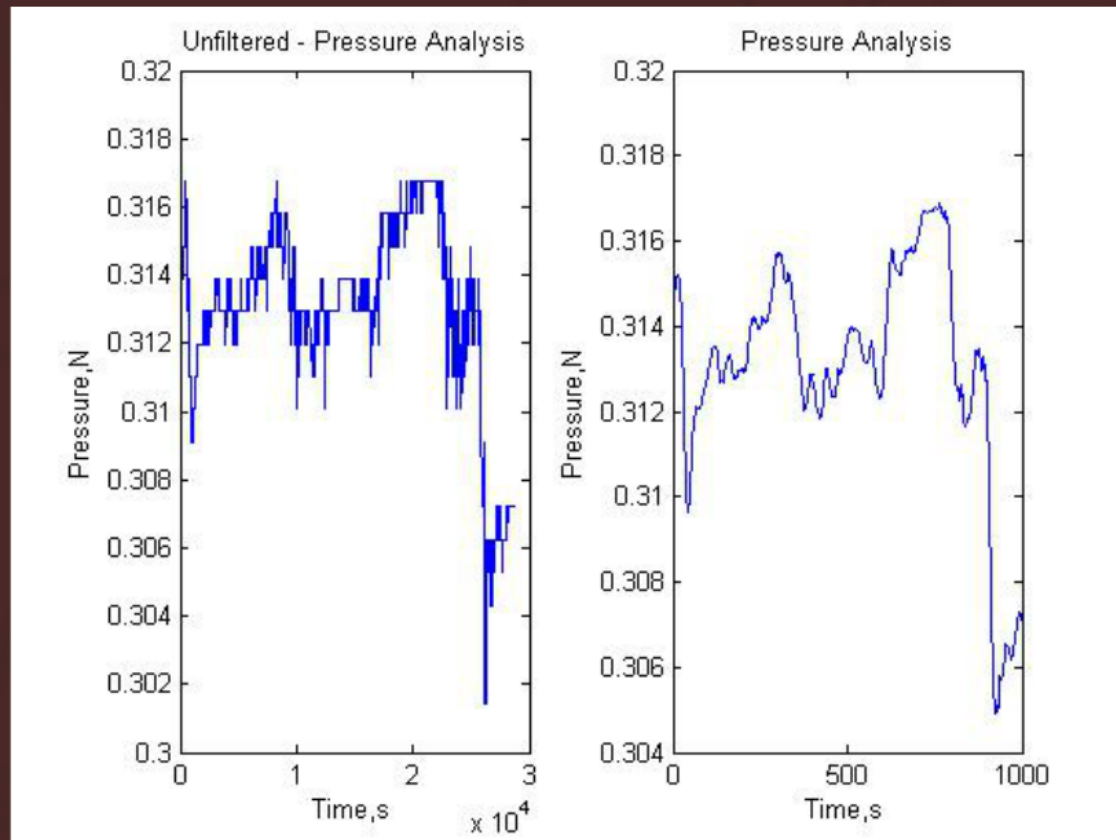
GUI displays the pressure measured by the FSR sensors as well as extracted the data from the accelerometer and gyroscope and converted the results to usable, readable data

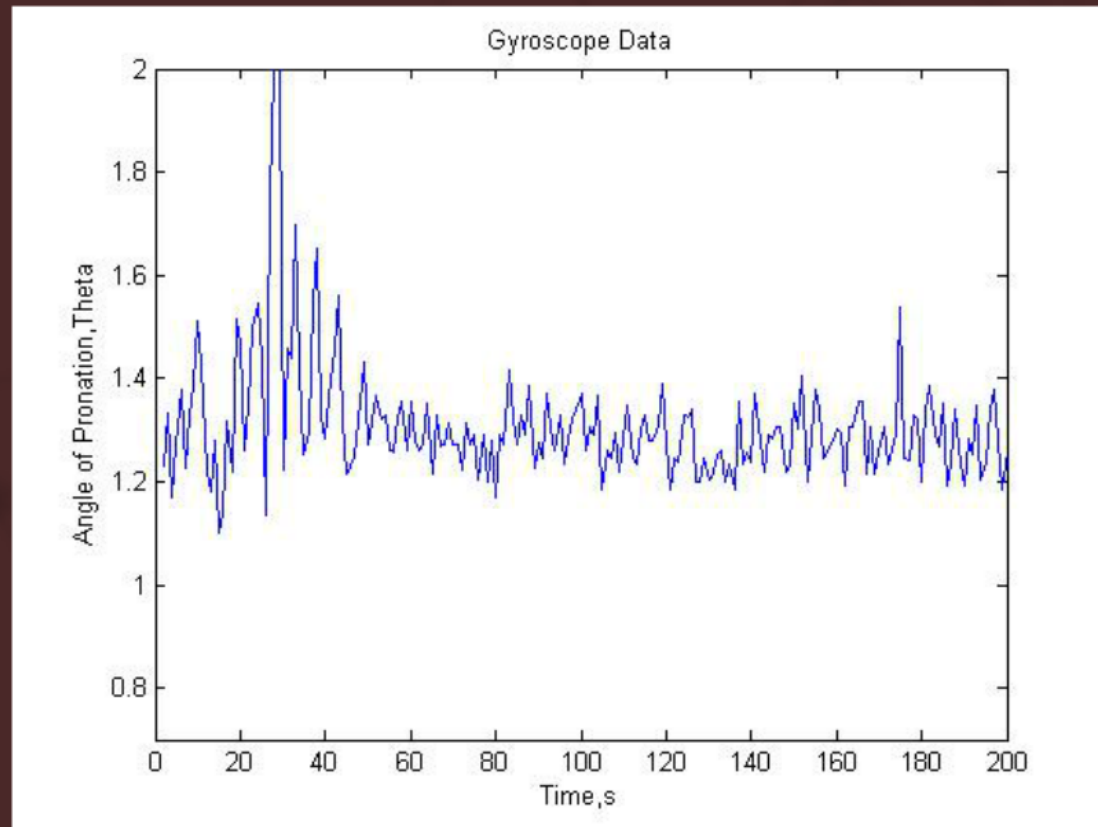
## Start page

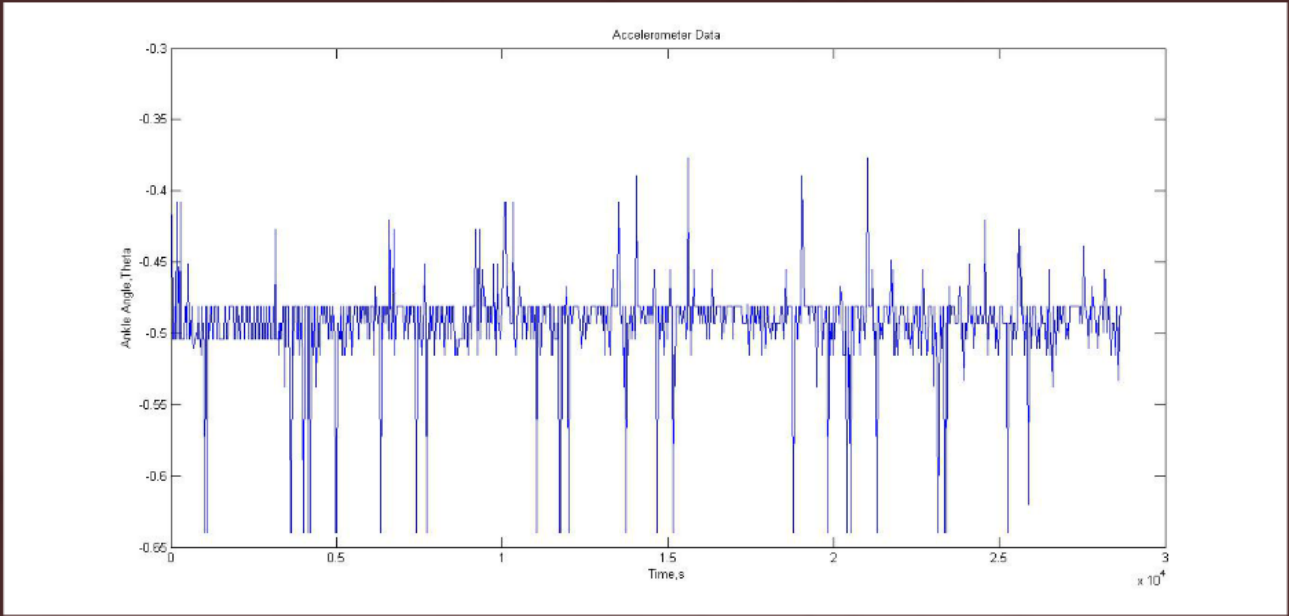


## Analysis page









# *Budget*

Original budget: \$ 984

Cost of the final product: \$495

Sources of Funding: ESSEF  
Contributed a Arduino Uno

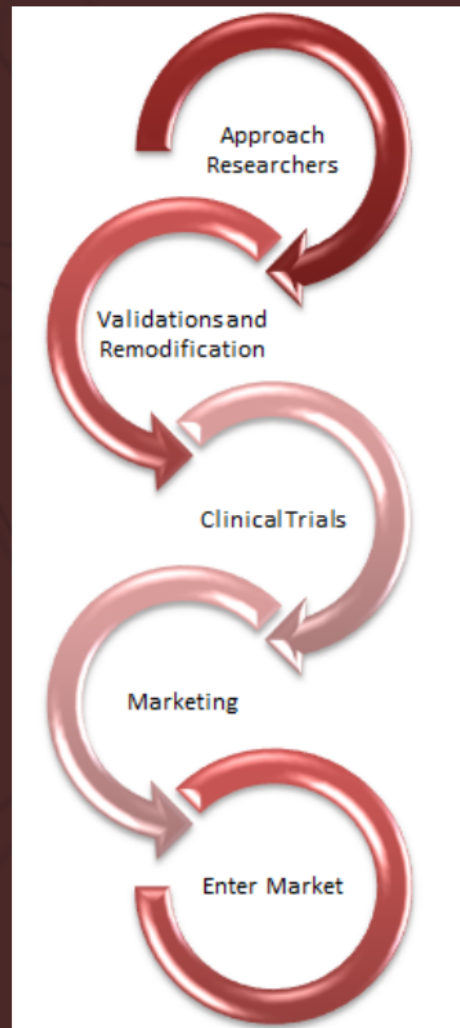


# Timeline

ID	Task Name	Start	Finish	Duration	Jan 2014				Feb 2014				Mar 2014				Apr 2014	
					5/1	12/1	19/1	26/1	2/2	9/2	16/2	23/2	2/3	9/3	16/3	23/3	30/3	6/4
1	Research of parts needed	01/01/2014	21/01/2014	15d	█													
2	Funding	01/01/2014	20/01/2014	14d	█													
3	proposal	06/01/2014	23/01/2014	14d	█													
4	Ordering parts	30/01/2014	30/01/2014	1d														
5	Rudimentary testing of design	14/02/2014	17/02/2014	2d					█									
6	Testing parts	14/02/2014	17/02/2014	2d					█									
7	Setting up and coding Arduino	14/02/2014	20/02/2014	5d					█									
8	Preparing Daatalogger and Microcontroller Unit	20/02/2014	28/02/2014	7d					█									
9	Debugging, Trouble shooting, and in general buffer time	26/02/2014	04/03/2014	5d									█					
10	Integrating sensor unit and microcontroller unit	28/02/2014	14/03/2014	11d									█					
11	Integrating sensor/microcontroller unit to gui and software	28/02/2014	01/04/2014	23d									█					
12	Enclosure and ankle wrap	20/03/2014	11/04/2014	17d									█					
13	Presentation PowerPoint and remaining documents to be completed	07/04/2014	11/04/2014	5d													█	
14	Programming GUI	10/03/2014	11/04/2014	25d									█					

- The project was successfully seen to completion
- The buffer week we had planned was utilized to further refine the hardware of the project

# Market Entry Plan



# Price Comparison with Competition

Product	Cost	Technology Used for detection	Storage Type	Data Type
F Scan	\$10000-12000	Resistive sensing elements	Computer memory	Force and Pressure
Pedar	\$31 000[6]	Capacitive Sensors [4]	Internal flash memory [5]	Pressure
PresTrack's System	\$1250**	Force Sensing Resistors	SD card	Pressure and ankle angle

## *Future Additions*

- Wireless capability
- Reduction of enclosure size
- Resolution of pressure
- Make a bilateral system
- Move away from open source components
- Refining the GUI to give more information (e.g statistics, colour map etc).

# *Learning Outcomes*

- Project Management
- Arduino Coding
- Interfacing sensors with software
- Product design and marketing
- Scheduling Timelines

# *Acknowledgements*

- Dr. Edward Jung Wook Park
- Dr. Carolyn Sparrey
- Dr. Ash M. Parameswaran
- Dr. Andrew Rawicz
- Steve Whitmore
- Lukas-Karim Merhi
- Jamal Bahari
- Jeff Krahn
- Fred Heep
- Gary Houghton



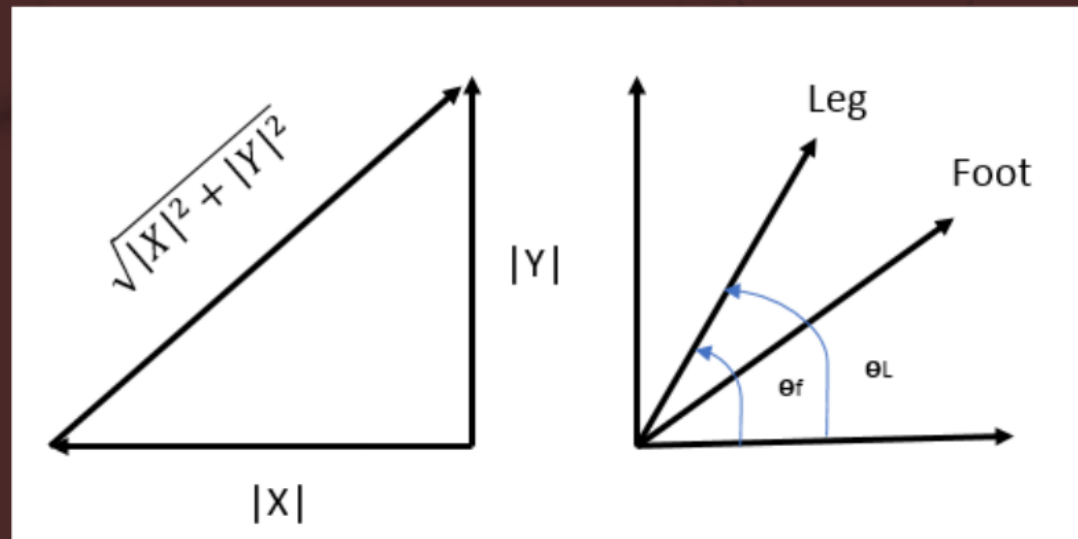
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- [1] "The epidemiology of plantar fasciitis," Lower Extremity Review. [Online]. Available: <http://lowerextremityreview.com/article/the-epidemiology-of-plantar-fasciitis> [Accessed: Jan. 20, 2014]
- [2] F-Scan® System [Online]. Available:<http://www.tekscan.com/medical/system-fscan1.html> [Accessed: April. 13, 2014]
- [3] Pedar® insole [Online]. Available: <http://www.novel.de/novelcontent/pedar>
- [4] Plantar Pressure, Temple University School of Podiatric Medicine. [Online]. Available at <http://podiatry.temple.edu/research/gait-study-center/techniques-and-methods/plantar-pressure> [Accessed Apr 13 2014]
- [5] Novel, Pedar -X MobilePedography , [www.novel.de](http://www.novel.de) [Online]. Available at [http://www.novel.de/pdf/flyer/eng/pedarX\\_eng.pdf](http://www.novel.de/pdf/flyer/eng/pedarX_eng.pdf) [Accessed Apr 13 2014]
- [6] Chen M, Huang B, Lee K, and Xu Y, " An Intelligent Shoe-Integrated System for Plantar Pressure Measurement " for IEEE International Conference on Robotics and Biomimetics December 17 - 20, 2006

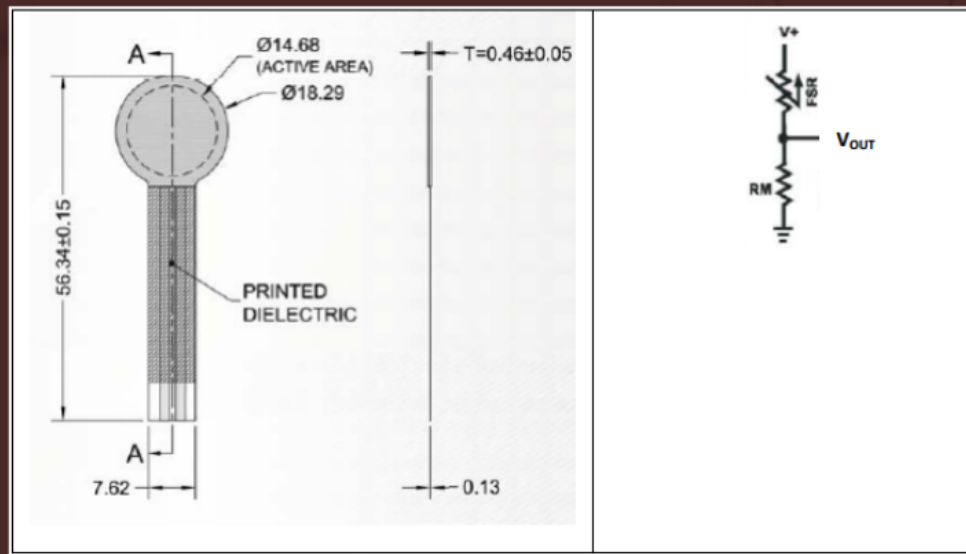
***Thank-you!***

***Questions?***

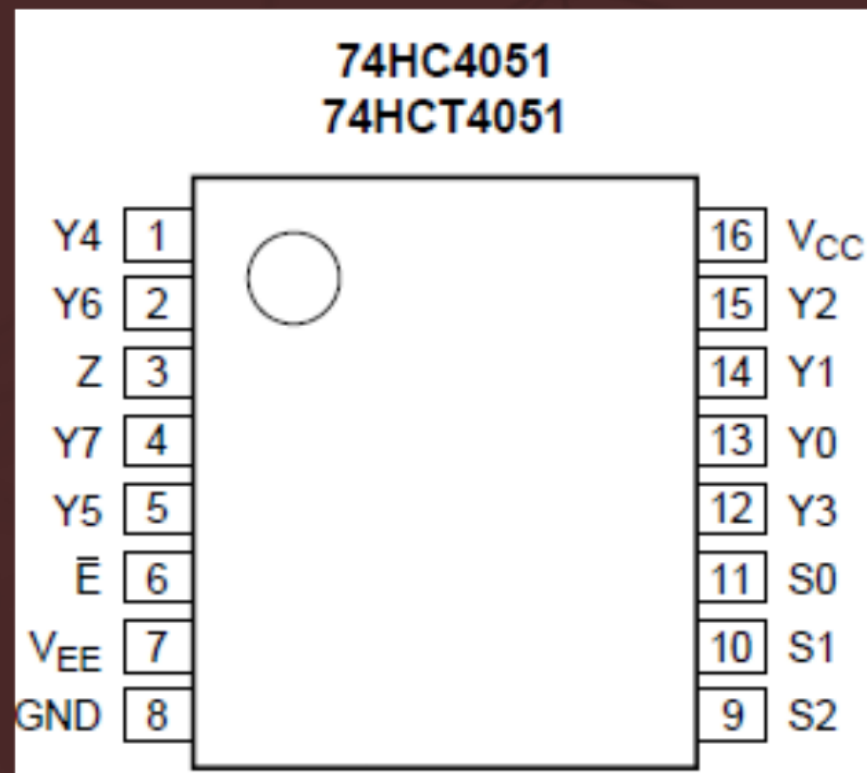
# Angle Calculation



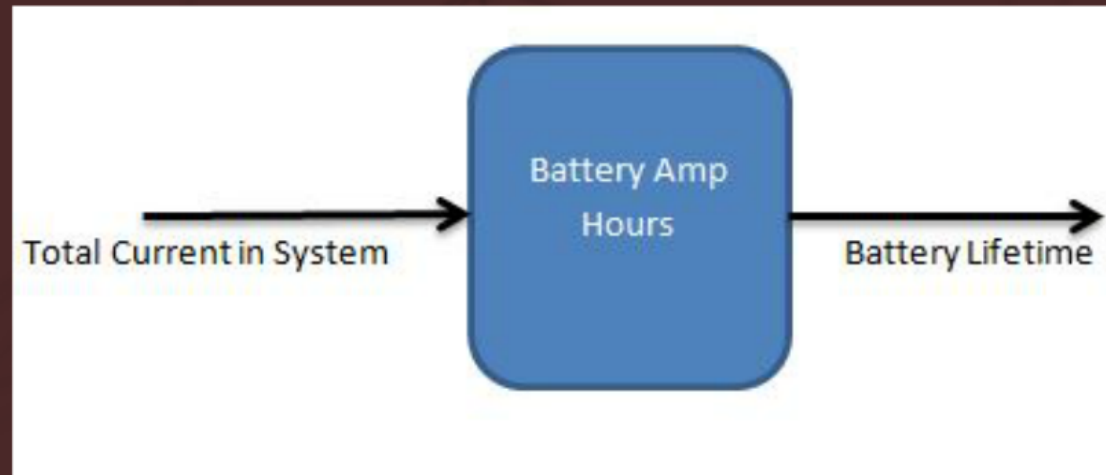
# FSR concept



# Multiplexer



# Battery Power Intake



- The battery lifetime is affected by the total amount of the current used by the system



# PresTrack

## Plantar Foot Pressure Analysis System

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