Embedded System Design for Rehabilitation

Engr. Amna Haider

Company: UCERD Pvt Ltd
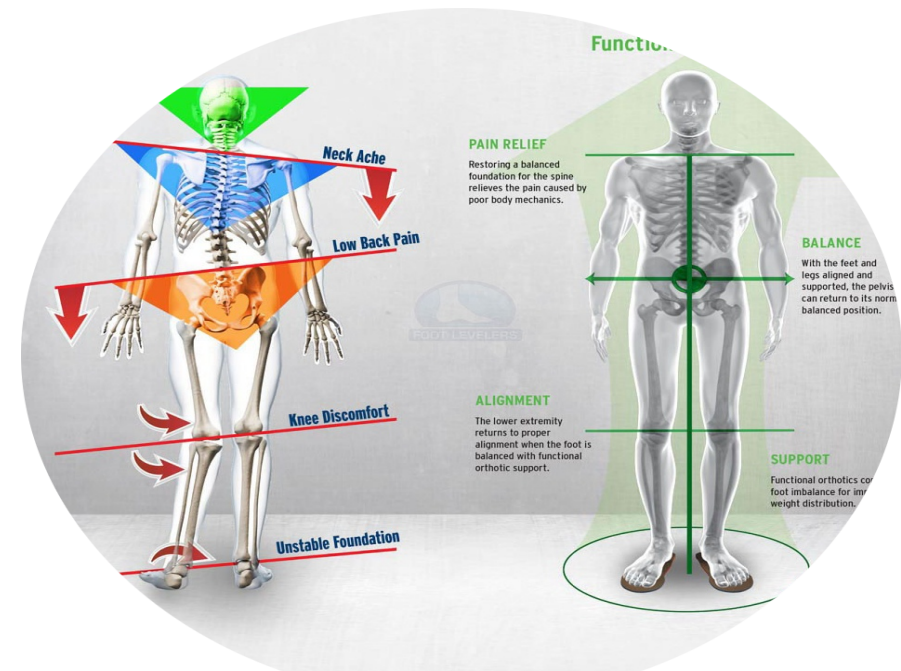
Foot Analytic

Problem

Correct body weight distribution is a very important issue in medical science and its analysis can help to improve health and well being for all.

Unfortunately there is no such indigenously made product in Pakistan.

Therefore a cost effective, user friendly foot analysis system for knowing the body weight is required for local community

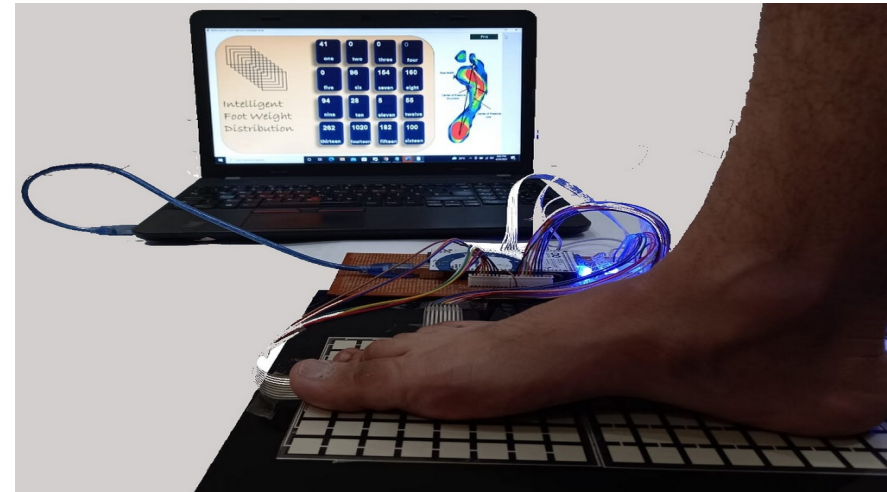**This application finds its usage in general medicine**

- Physical And Occupational Rehabilitation

- Footwear Design

- Gynecology Clinics

- Sport-Related Application
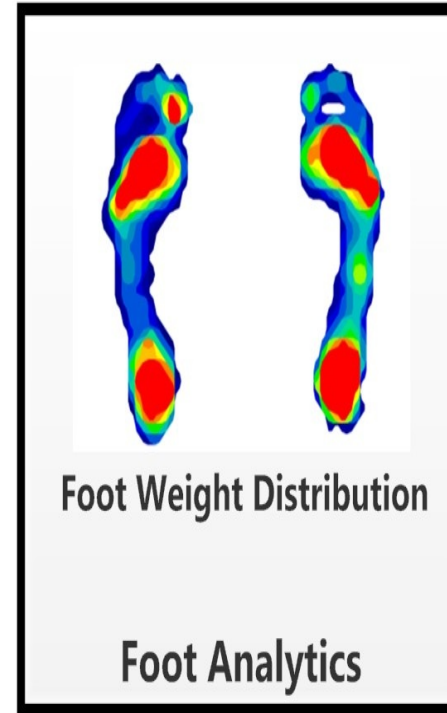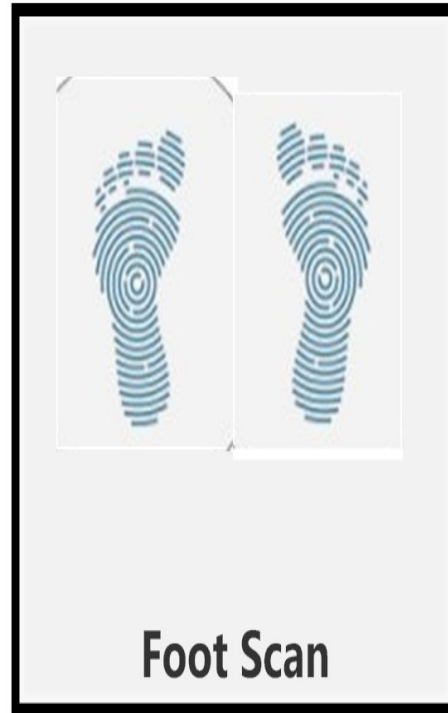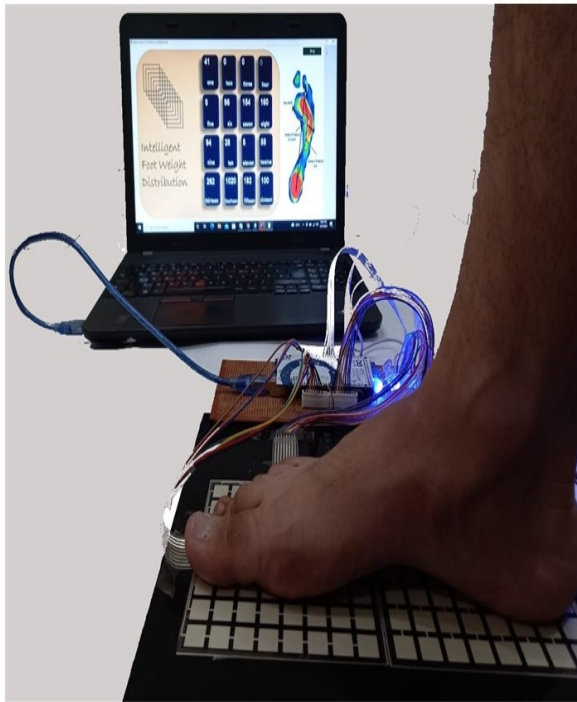
- Balance Control

- Biometrics

Solution: Smart Weight Distribution System (MVP)

Smart Foot Weight Distribution system is a digital foot analysis tool which tells weight distribution on different parts of foot.

- It consists of three parts
  - Sensing Unit
  - Processing Unit
  - Display Unit

- The system read pressure on different parts of foot and by applying intelligent algorithm identifies and predict problems.

- The system is low-cost energy efficient, programmable for wide range of applications, scalable and reliable for different targeted technologies and advanced data-set.

Solution: Smart Weight Distribution System (MVP)

Foot Scan

Foot Weight Distribution

Foot Analytics

Recommendations Exercise, Diet etc.

Orthoses Foot Sole, Support Belt, etc.

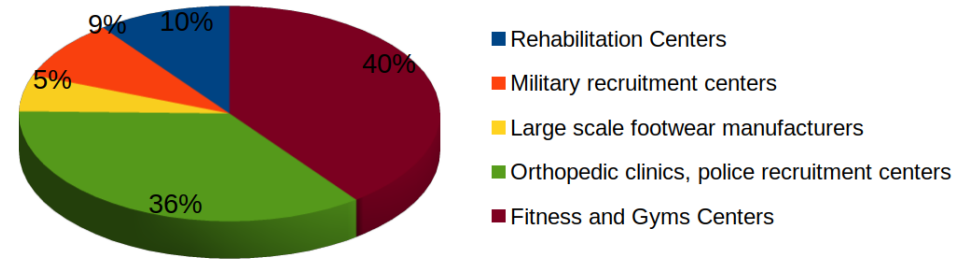Recommendation Medical Procedures

Decisions

Target Market

- 30 Rehabilitation Centers in Pakistan
- 26 Military recruitment centers across Pakistan
- 171 Fitness and Gyms Centers in Pakistan
- 16 Large scale footwear manufacturers
- 104 Orthopedic clinics

- 5 Million pregnancies took place in Pakistan
- 19 Million diabetic adults for the prevention of foot ulceration

Foot Weight Distribution
Multi Piece Byers in Pakistan

- Rehabilitation Centers
- Military recruitment centers
- Large scale footwear manufacturers
- Orthopedic clinics, police recruitment centers
- Fitness and Gyms Centers

Single Piece Buyer
in Pakistan

- Million Pregnancies
- Million diabetic adults for the prevention of foot Ulceration
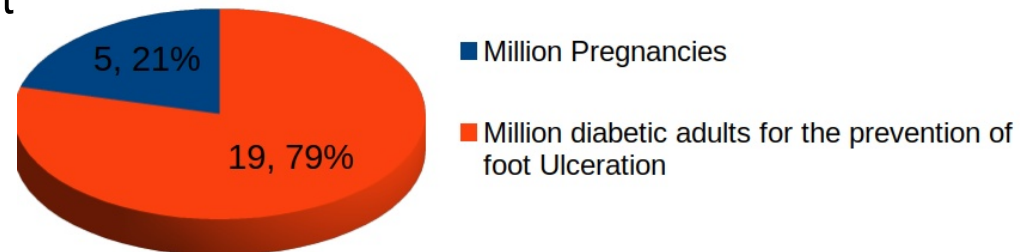
Competitor Analysis

- **Scanners - Aetrex Technology**
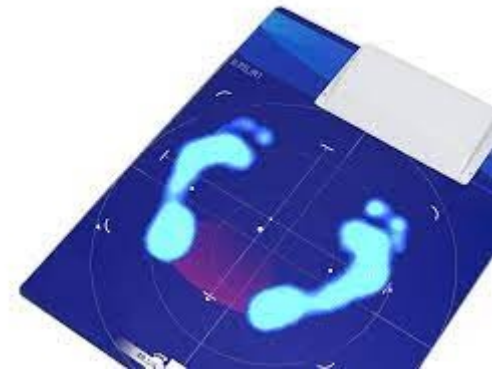 - ➢ Albert 2 Pro Scanner
  - ➢ HW $2,495
  - ➢ SW $150 per month

- **TekScan**
  - ➢ F-Scan System
  - ➢ Above 2,000$

- **Tactilus**
  - ➢ High performance footplate
  - ➢ Above 5,000$

Road Map

Product
Policy-I

200+ Training Center
10000+ Gym and Fitness Centers
50000+ Medical Clinics
Total = 60000

Manufacture Price = 30K
Sale Price 50K
Profit per product = 20K Pkr

0.5% 1st Year Profit (Million) = 6
1% 2nd Year Profit (Million) = 12
**With 5% Up to 5th Year
Profit (Million)= 50**

Renting
Policy-II

Single Machine
Price per test = 100 PKR
Average subject per day = 25
Revenue Per day = 2500
0.9 Million / Year

Critical Add-on Solutions
Policy-III

Real-time Gate Analytic Solutions:
Smart Mobile Analytic Application

50+ Rehabilitation Centers
50+ Foot Wear Designers
100+ Orthopedic
Sports Industry
Medical Problems

Go to Market

5 Years: Financial Projection

Years	1	2	3	4	5
No of Unit Produced	20	100	150	200	250
Unit Product Price	30,000	35,000	40,000	50,000	60,000
Unit Sale Price	50,000	60,000	75,000	80,000	100,000
Services (Renting)	500,000	1,000,000	1,500,000	2,000,000	2,500,000
Cost of Production	600,000	3,500,000	6,000,000	10,000,000	15,000,000
Revenue	1,500,000	7,000,000	12,750,000	18,000,000	27,500,000
Operational Cost	500,000	500,000	1,000,000	1,200,000	1,500,000
Administrative Cost	200,000	200,000	300,000	300,000	300,000
Misc. Other Cost	250,000	300,000	350,000	400,000	500,000
Total Cost	950,000	1,000,000	1,650,000	1,900,000	2,300,000
Net Profit Before Tax	-50,000	2,500,000	5,100,000	6,100,000	10,200,000
Gross Profit	-60,500	1,975,000	4,029,000	4,819,000	8,058,000

Working Capital 10,000,000

Average Product Price 46,505

Average Sale Price 73,000

ROI 238.5 %

IRR 37.6%

NPV 18,820,500

5 Years Financial Forecast

Team

- Project In-charge (Engr. Amna Haider)
  - Biomedical Engineering Expert
- Technology Expert
  - Prof Tassadaq Hussain (Computer Architect)
- AI Developer
- Embedded System Designer
- Real-time Application Programmer
- Marketing and Advocacy
  - Rehmat Ullah (IRP)
  - Rizwan Butter (Zauq Pvt Ltd)

Foot Analytic

www.footanalytic.com

Design and Development

- Data Architecture

- Software Architecture

- Hardware Architecture

- Front-end Architecture

Design & Development Phases

- Hardware Architecture
- Data Architecture
- Software/Application Architecture
- Display Architecture (GUI)
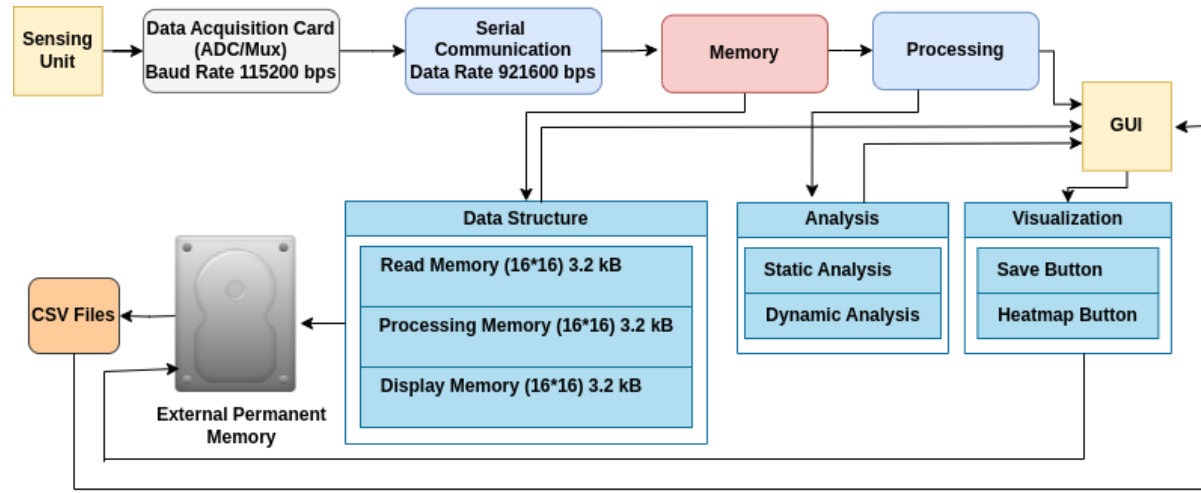
Phase I: Hardware Architecture

- The Hardware Architecture includes two units
  - Data Acquisition Unit
    - 8x8x2 Sensors
    - 2 Load Cell
    - Analog to Digital System (Resolution, FPS)
    - Serial Communication System (bps)
  - Processing System Unit
    - Serial Communication System (bps)
    - Memory System (MB)
    - Uni-Core RISC Processor (OPS)

Phase II: Data Architecture

- Data Type
  - } List Unit?

- Data Structure
  - } Single Sensor (8x8 Dual Buffer)
  - } Permanent Memory Data Structure (CSV)?

- Data Storage and Management Policy
  - } Dual Buffer
    - Read Buffer from DAU
    - Display Buffer to VGA
    - Updating Mechanism
  - } Permanent Memory Mechanism and Policy

Phase III: Application Architecture

- Cleaning

- Data Transformation

- Feature Extraction

  } ML/DL
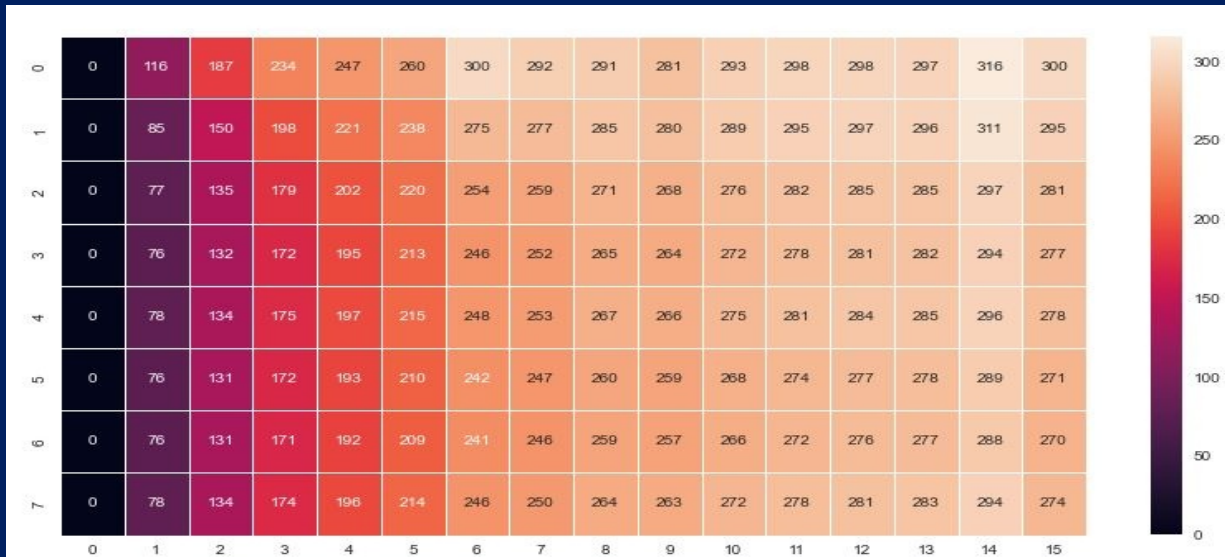
- Analysis

Phase IV: Display Architecture (GUI)

Thanks
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