

## **Universiti Malaysia Perlis**

#### INVENTORS

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# **WIRELESS SHOE IN-SOLE** SYSTEM IMPLEMENTATION FOR BIOMEDICAL **APPLICATIONS**



### PRODUCT DESCRIPTION

WIRELESS SHOE IN-SOLE is a system to measure the orientation and pressure field that acts between the foot and the support surface during everyday activities. Information derived from such pressure measures is important in posture and gait research to analyze the biometric identification, footwear design, lower limb problems, rehabilitation, health diagnostic and others.

This research focuses on the development of a portable shoe integrated with wireless and recent electronic based system. It goes with the custom design package includes pressure sensor, Arduino Uno microprocessor, XBee wireless signal transmission, ultrasonic, Inertia Measurement Unit (IMU) and power supply unit. The shoe system was tested and prove to satisfy the human movement analysis based on gait parameters which include foot mapping pressure behavior. The system focuses on the biometric application and diabetic foot pressure point. From this research, it is found that the system was able to measure the movement parameter wirelessly with ease and efficient.

## **INVENTION ADVANTAGES**

- Very Cost Effective
- **Environmental Friendly**
- Availability for Other Applications:
- Athlete performance monitoring
- Rehabilitation Monitoring
- Diabetic Ulcerations Detection
- Early Fall Prevention for elderly

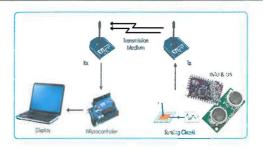
#### NOVELTIES

- In-house wireless system implementation.
- Towards Green Technology due to:
- No photolithography processes used
- Used active sensor (piezoelectric) that does not need an external power

## COMMERCIAL POTENTIALS

- Military army identification system with biometric applications.
- Gait analysis for rehabilitation monitoring at hospital.
- Universal athlete performance monitoring.
- Low cost for mass production (USD80/ unit for 100 units production

## SYSTEM CONFIGURATION



## PROCESS DEVELOPMENT



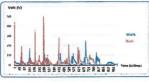
Figure 2: Zinc Oxide Thin Film **Pressure Sensor Preparation** 



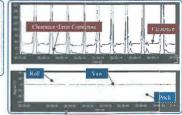
#### RESULTS

Figure 1: Gait Based Biometric

**Identification Process Flow** 



(Single Cell) Voltage (weight) Versus Time (s). Comparison between two difference weight.



(IMU & Ultrasonic) Combination between leg orientation (roll, yaw, pitch), foot clearance and foot pressure mapping will provide specific identification for persons.

## CONCLUSION

The device with the custom design includes piezoceramic sensors, IMU, ultrasonic, Arduino microcontroller and XBee modules is successfully developed and analyzed for biometric application in real life time.

