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PROJECT PRESENTATION ON

LOWER EXTREMITY PRESSURE DEVICE

UNDER THE GUIDANCE OF :
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ABSTRACT

- Weight-bearing is the amount of weight a patient puts on an injured body part. Generally, it refers to a leg, ankle or foot that has been fractured or upon which surgery has been performed.

- When a person goes through a surgery in his leg and is in recovery phase, he is not able to put the required weight on his injured leg.

- We proposed a method that can determine the weight that the person is putting within the injured leg and a buzzer is set to alarm if he exceeds the given limit during recovery phase.

- The given method is best suitable for weight bearing condition and the device is calibrated accordingly.

INTRODUCTION

- The lower extremity refers to the part of the body from the hip to the toes. The lower extremity includes the hip, knee, and ankle joints, and the bones of the thigh, leg, and foot.

- Having a reduced weight bearing status for a lower limb can have wide reaching impacts on walking and ambulation.

- Injuries or surgeries most commonly indicating a lower weight bearing status include total or partial joint replacements, bone fractures (surgically and non-surgically repaired), and tendon or ligament repairs.

LITERATURE SURVEY

TITLE AND YEAR	AUTHOR	ABOUT	DISADVANTAGES
1. Classification of Three Types of Walking Activities Regarding Stairs Using Plantar Pressure Sensors.(2017)	Gu-Min Jeong, Member, IEEE, Phuc Huu Truong, and Sang-Il Choi, Member, IEEE	Problem formulation and plantar pressure monitoring system.	Since improper walking on stairs may cause the sensors to give either front foot reading or back foot.
2. Quantitative method for gait pattern detection based on Fiber Bragg grating sensors.(2018)	Lei Ding Xinglin Tong Lie Yu	This paper presents a method that uses Fiber Bragg grating (FBG) sensors to distinguish the temporal gait patterns in gait cycles.	Sometimes, the subject was sweating in the experiments, so the FBG sensor fell off. As a result, the experiment was stopped until the subject cooled.

LITERATURE SURVEY

TITLE AND YEAR	AUTHOR	ABOUT	DISADVANTAGES
3.Foot Pressure Mapping System Using Strain Gauge Pressure Sensors.(2019)	Sakshi Sethi Assistant Professor Amity University, Gurgaon, Haryana, India.	This project helps in the monitoring of the pressure distribution underneath the foot of normal and abnormal feet in numerous situations.	Here its talking about different sensors for different point on foot but collective of all sensor is required to measure total human body pressure applied on foot.
4. FSR Sensor based Embedded system to detect imbalance in Autistic children.(2020)	Sakshi Sethi Assistant Professor Amity University, Gurgaon, Haryana, India.	This project helps in the monitoring of the pressure distribution underneath the foot of normal and abnormal feet in numerous situations.	Here its talking about different sensors for different point on foot but a collective of all sensor is required to measure total human body pressure applied on foot.

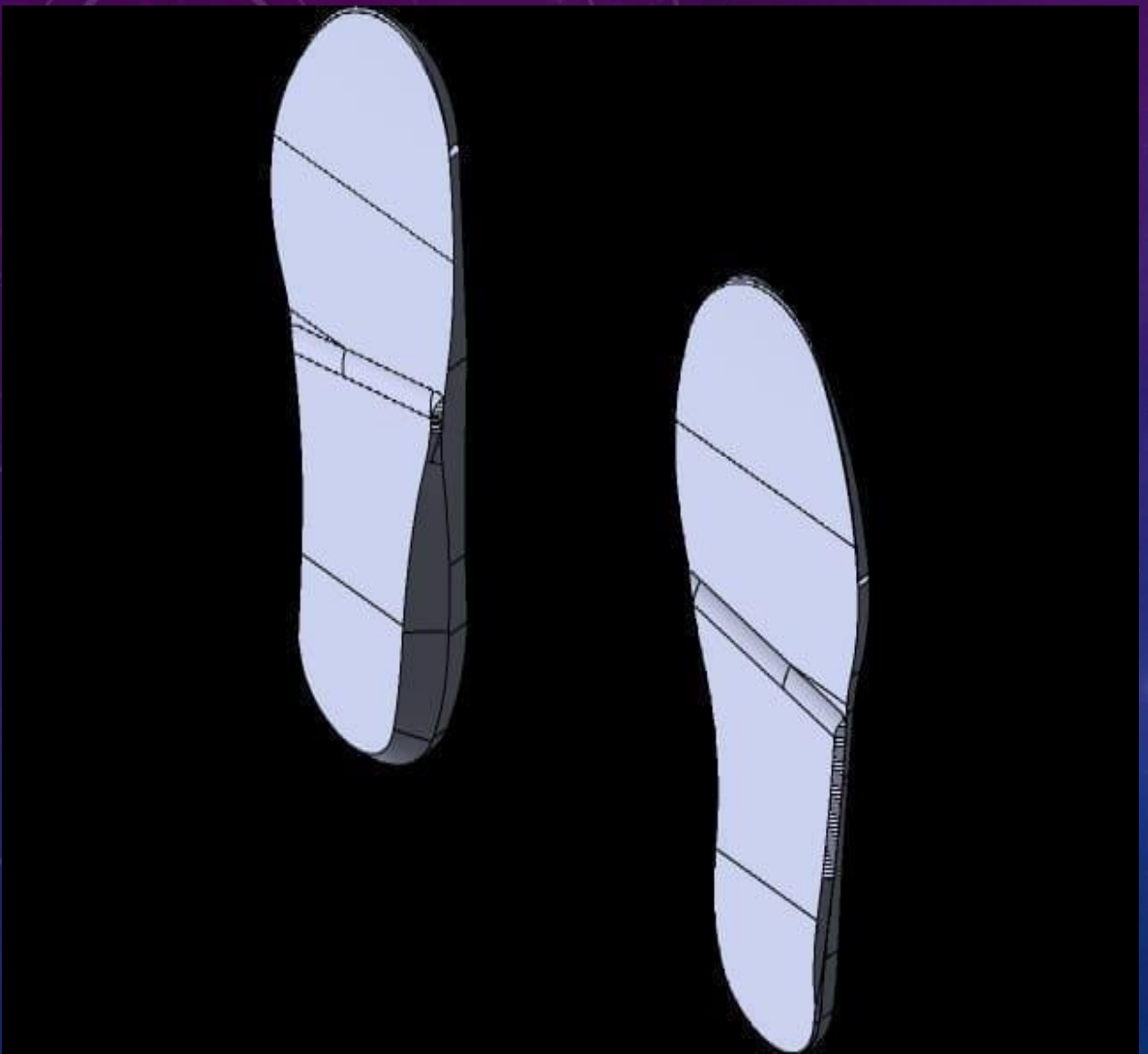
LITERATURE SURVEY

TITLE AND YEAR	AUTHOR	ABOUT	DISADVANTAGES
5. Optical-Based Foot Plantar Pressure Measurement System for Potential Application in Human Postural Control Measurement and Person Identification.(2021)	Tanapon Keatsamarn , Sarinporn Visitsattapongse, Hisayuki Aoyama and Chuchart Pintavirooj.	This research designs an optical-based foot plantar pressure measurement system aimed for human postural control and person identification.	The LED and cameras installed are sensitive and can have adverse effect when they goes off.
6. A 3D-Printed Capacitive Smart Insole for Plantar Pressure Monitoring.(2022)	Anastasios G. Samarentsis , Georgios Makris , Sofia Spinthaki , Georgios Christodoulakis , Manolis Tsiknakis and Alexandros K. Pantazis.	The study of human walking, namely gait analysis, can be used as a valuable diagnostic tool to distinguish between normal and pathological gait.	Since it has chain of 3D printed sensors implanted. The Realtime data processing may have problem on breakage of sensors.

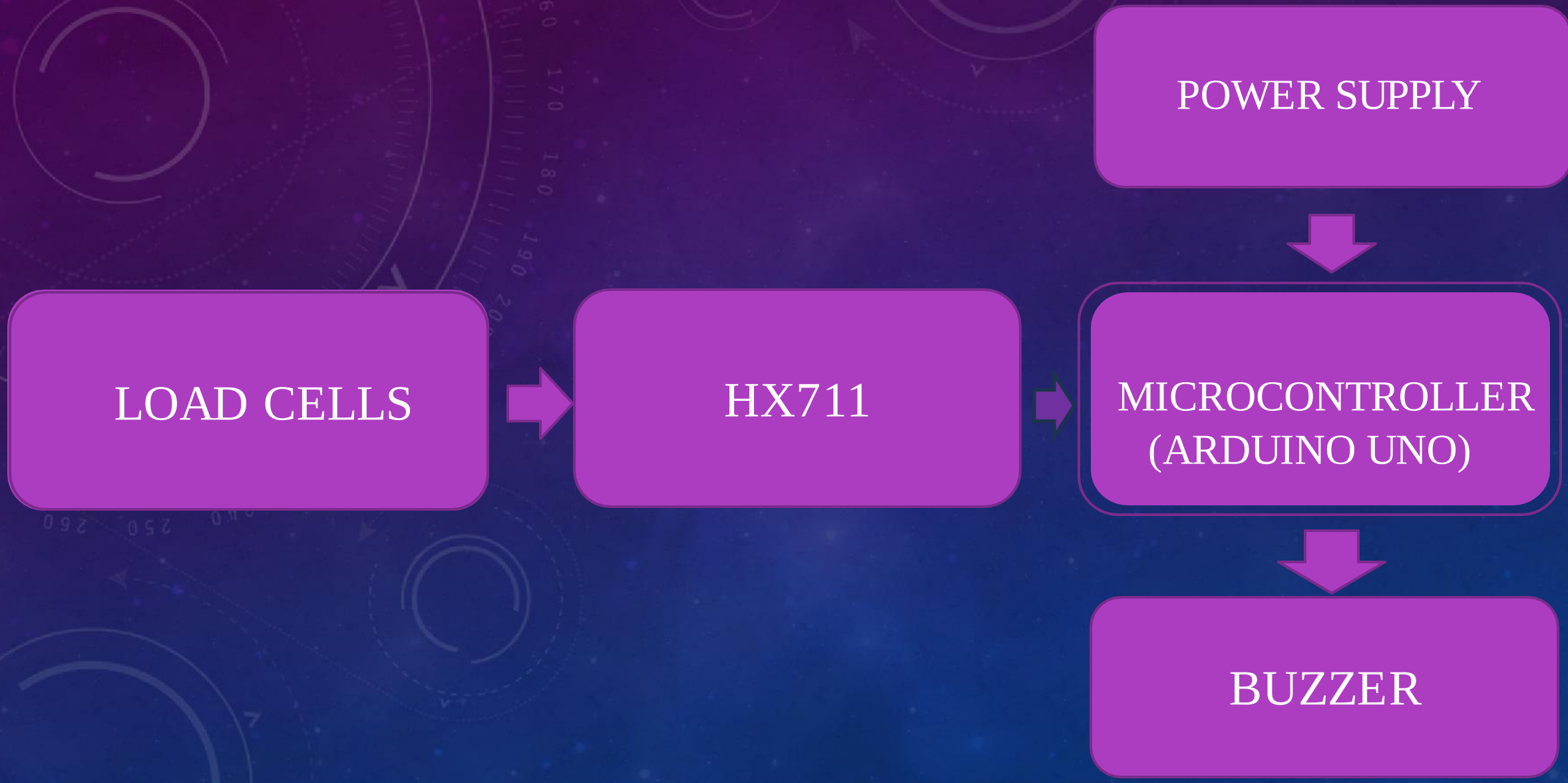
METHODOLOGY

- Industrial major software tools for the design, modelling and simulation of the device will be used to get better and accurate results.
- Below are the list of software tools and materials required for this work -
- Catia v5 (for computer aided drawing and 3D Modelling.
- A 3D printer for prototyping the embodiment (a trial-and-error process).
- The printed insole will be used to place the sensors on it and to give a base to stand on.

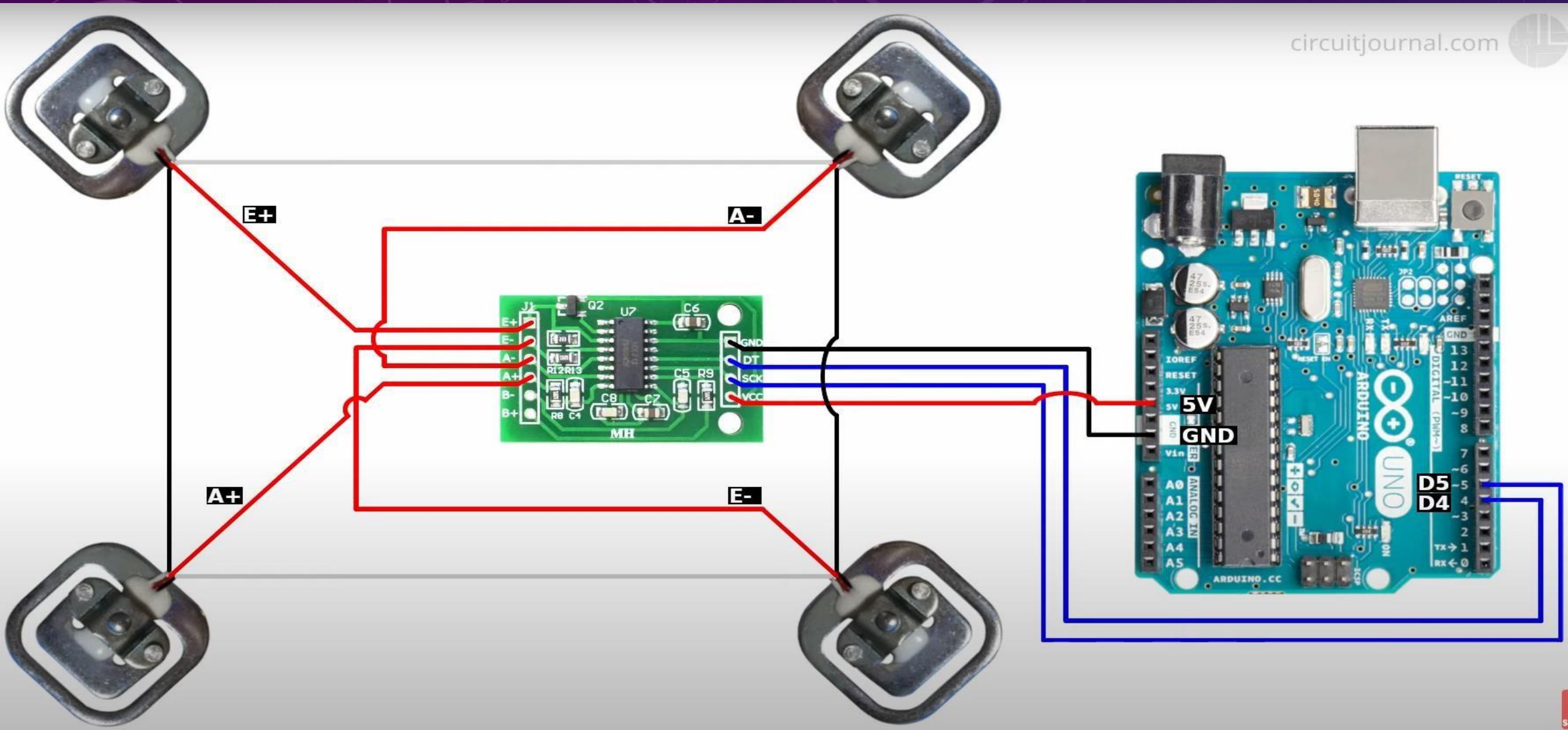
INSOLE DESIGN AND SHOE MODEL



BLOCK DIAGRAM



CIRCUIT DIAGRAM



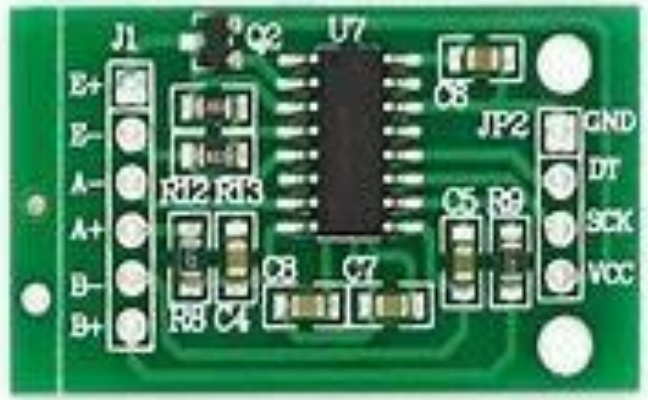
HARDWARE

1. STRAIN GAUGE LOAD CELLS

- Strain gauge load cells usually feature four strain gauges.
- The force being measured deforms the strain gauge in this type of load cell, and the deformation is measured as change in electrical signal.
- Essentially, a compression load cell is a block that is designed to hold a load at one point to measure the compression. While tension load cells measure the pulling force, compression load cells measure a pushing force along a single axis.

2. HX711

- The HX711 IC that allows you to easily read load cells to measure weight. By connecting the amplifier to your microcontroller you will be able to read the changes in the resistance of the load cell, and with some calibration you'll be able to get very accurate weight measurements.
- This can be handy for creating your own industrial scale, process control or simple presence detection.
- The HX711 uses a two-wire interface (Clock and Data) for communication.



3. BUZZER

- An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound.

- Sometimes, the vibration diaphragm will vibrate & generates sound under the magnet & solenoid coil interaction. The frequency range of this ranges from 2 kHz to 4kHz.

4. ARDUINO UNO

- The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.
- The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.
- The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.[4] It can be powered by a USB cable or a barrel connector that accepts voltages between 7 and 20 volts, such as a rectangular 9-volt battery.

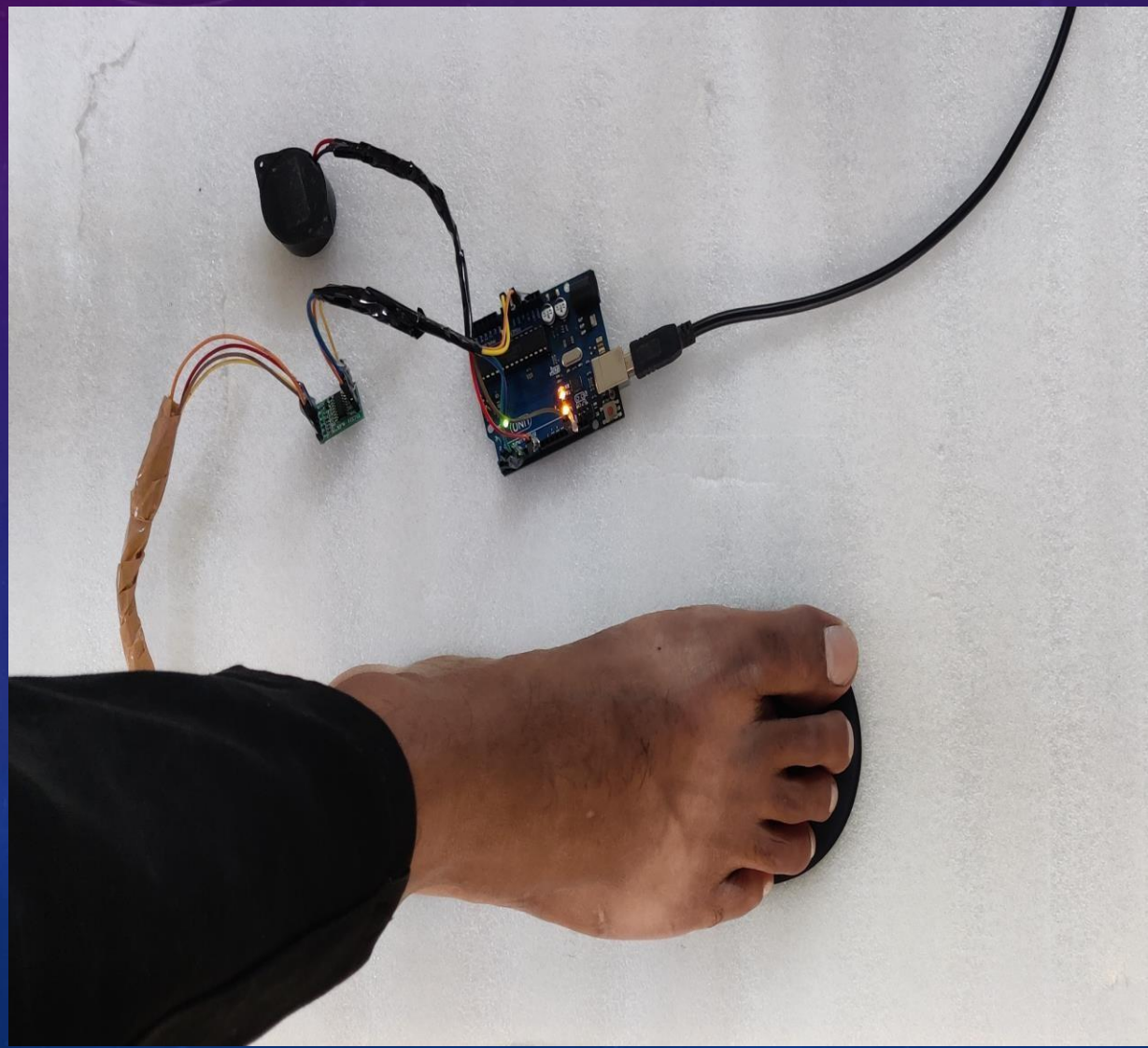
SOFTWARE

- The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. This software can be used with any Arduino board.

- The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

- The obtained value will be displayed in the serial monitor according to the baud rate saved.

RESULT ANALYSIS



RESULT ANALYSIS

PATIENTS DETAILS	NORMAL WEIGHT(KG)	WEIGHT BEARING CONDITION (FOOT)	PRESCRIBED WEIGHT
1.PRASAHANT	60	RIGHT	18 (30% of weight)
2.KARTIK	75	RIGHT	30 (40% of weight)
3.SUMAN	80	LEFT	20 (25% of weight)
4.SURAJ	90	LEFT	31.5 (35% of weight)

CONCLUSION

- The designed and manufactured device will have adequate precision and functional life with unique properties such as having an external, replaceable and disinfect able sensor, digital outlet and the ability to measure the lower extremity pressure.
- We will be able to evaluate the pressure one can exert after surgery and can be able to adjust it according to his/her condition.
- The buzzer being our alarm will be sent on if the person exerts more pressure than the values set.
- The final values will be recorded and the person will be instructed by the examiner to apply the give pressure according to the outcome.

FUTURE SCOPE

- In the future, this study, measuring the lower extremity pressure of human can be applied to simulate foot manipulation in many biomedical and robotic applications.
- A lighter and portable version of this lower extremity pressure monitoring device can be produced.
- It can be widely used by physiotherapist for monitoring lower extremity pressure .
- It can be used by medical intern for practicing and evaluating different condition.

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THANK YOU