CEC Continuing Education Center

DesignNews

Prototyping and Programming ESP32 Wearable Devices

# DAY 4 : Wearable Audible/Alert Devices

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# Webinar Logistics

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# Dr. Don Wilcher

Visit ‘Lecturer Profile’ in your console for more details.

# Course Kits


## Starter Kit M5GO IoT V2.6

## Core2 ESP32 For AWS IoT EDUKIT



# Agenda:

- Prototyping Wearable Devices Concepts
- M5Stack Demonstration Units
- Lab: Wearable PIR-Motion Activated Alarm


# Wearable Technologies :

"Progress in wearable technologies for monitoring is driven by the same factors that were behind the transition from desktop computing and communication tools to portable devices providing processing and ubiquitous connectivity, namely changes in social and economical factors" (Bonfiglio & De Rossi, 2011).

# Prototyping Wearable Devices Concepts

## What is Prototyping?: Definitions


- “A prototype is an approximation of the product along one or more dimensions of interest” (Ulrich et al.,2020).
- “Prototyping is the process of developing such as approximation of the product” (Ulrich et al., 2020).
- “Prototyping is a strategy for efficiently dealing with things that are hard to predict” (Klemmer, 2012)

# Prototyping Wearable Devices Concepts. . .


## How to Prototype Wearable Devices? Thoughts and Considerations

- "It's better easier to wave through ideas, before you even know what technologies you might use to create them" (Hartman, 2014).
  a) identify a gap
  b) or concern
- "The technology that your prototype does not have to actually exist" (Hartman, 2014).
  a) Can be one of your own invention
  b) Imagine the wearable be worn on the body or a garment.
  c) An accessory for Protective Protection Equipment (PPE)

# Prototyping Wearable Devices Concepts. . .


## How to Prototype Wearable Devices? Thoughts and Considerations

- "Create something from raw materials" (Hartman, 2014).
- "It does not have to be fancy" (Hartman, 2014).
  a) paper
  b) duct tape
  c) sharpies will do just fine (Hartman, 2014).
- Big IDEA: You do not have to implement any technology- A conceptual prototype!
  a) be creative
  b) playful
  c) inventive

# Question 1

**A prototype is an approximation of the service along one or more dimensions of interest.**

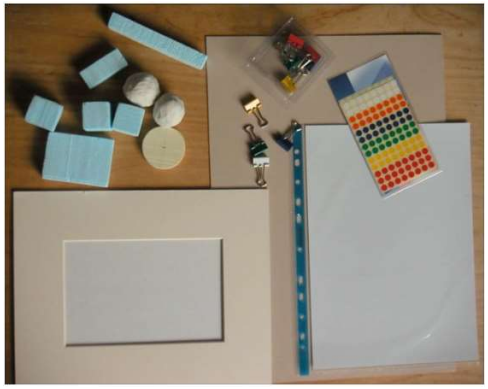
**a) True**

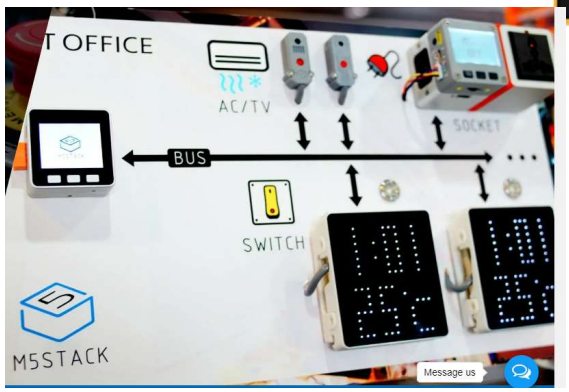
**b) False**

# Prototyping Wearable Devices Concepts. . .

## Prototyping Materials and Kits


Schon et.al (2020)






Schon et.al (2020)


# Prototyping Wearable Devices Concepts. . .


## Wearable Monitoring Systems: Thoughts and Considerations

- One of the safeguards against life-threatening conditions is ability to sense presence of on coming danger before it happens (Rake, 1988)
- The approach to providing safety safeguards was accomplished with one or more five basic human senses: (Rake, 1988).
  a) sight
  b) hearing
  c) smell
  d) taste
  e) touch
- Times are now mature to augment human senses with the emerging branch of wearable electronics.

# Prototyping Wearable Devices Concepts. . .

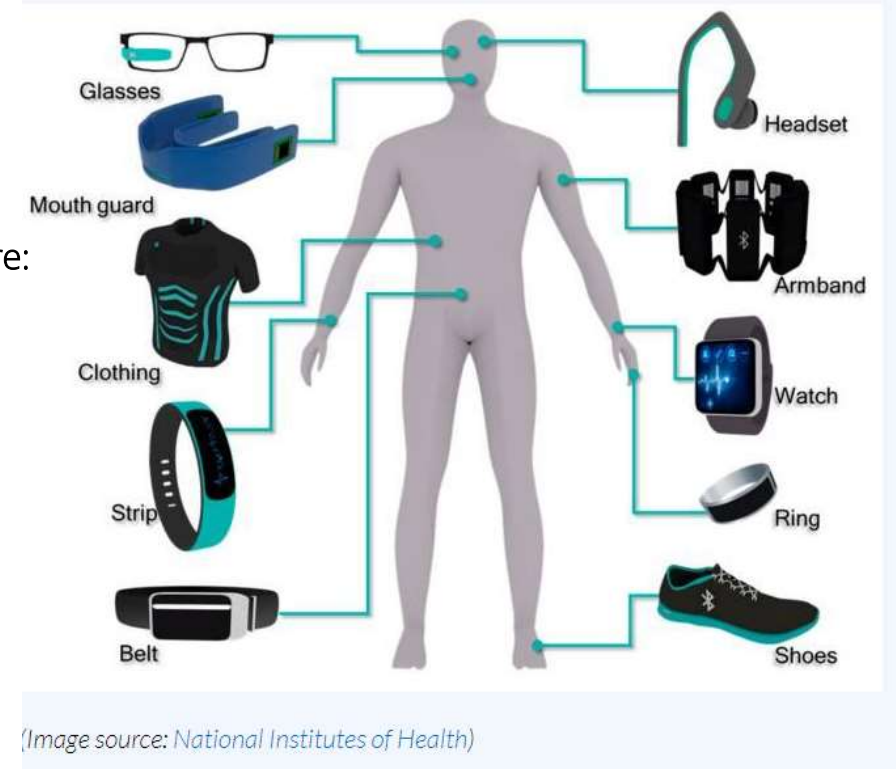

## Wearable Monitoring Systems: Thoughts and Considerations

- "The best time to start prototyping wearables is now" ( Hartman, 2014).
- Augmentation of human senses can be accomplished with advances in:
  - a) information processing technology
    - i. Machine Learning
    - ii. Microcontrollers and electronic sensors
    - iii. Edge computing
    - iv. Cloud Technology
    - v. IoT
  - b) Overall goal of such human senses augmentation system is:
    - i. improving safety
    - ii. Efficiency of emergency interventions (Bonfiglio & De Rossi, 2011)

# Prototyping Wearable Devices Concepts. . .

## Wearable Monitoring Systems: Thoughts and Considerations


Wearable Devices in Healthcare: non-invasive locations




(Image source: National Institutes of Health)

Goodard, W. (2011, May 17)

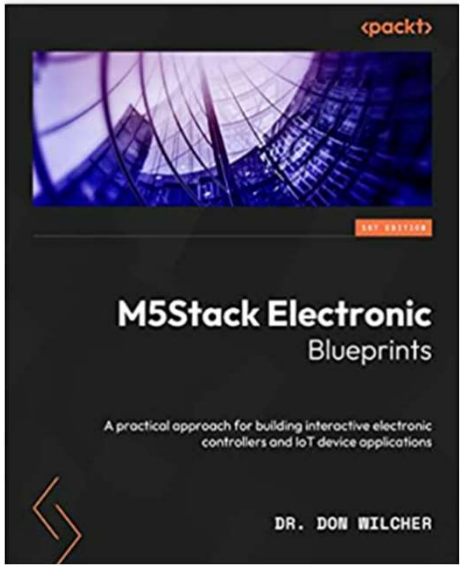
# Question 2

**Which researcher/author said, "The best time to start prototyping wearables is now".**

**a) Bonfiglio & De Rossi**
**b) Hartman**
**c) Nash**
**d) none of the above**

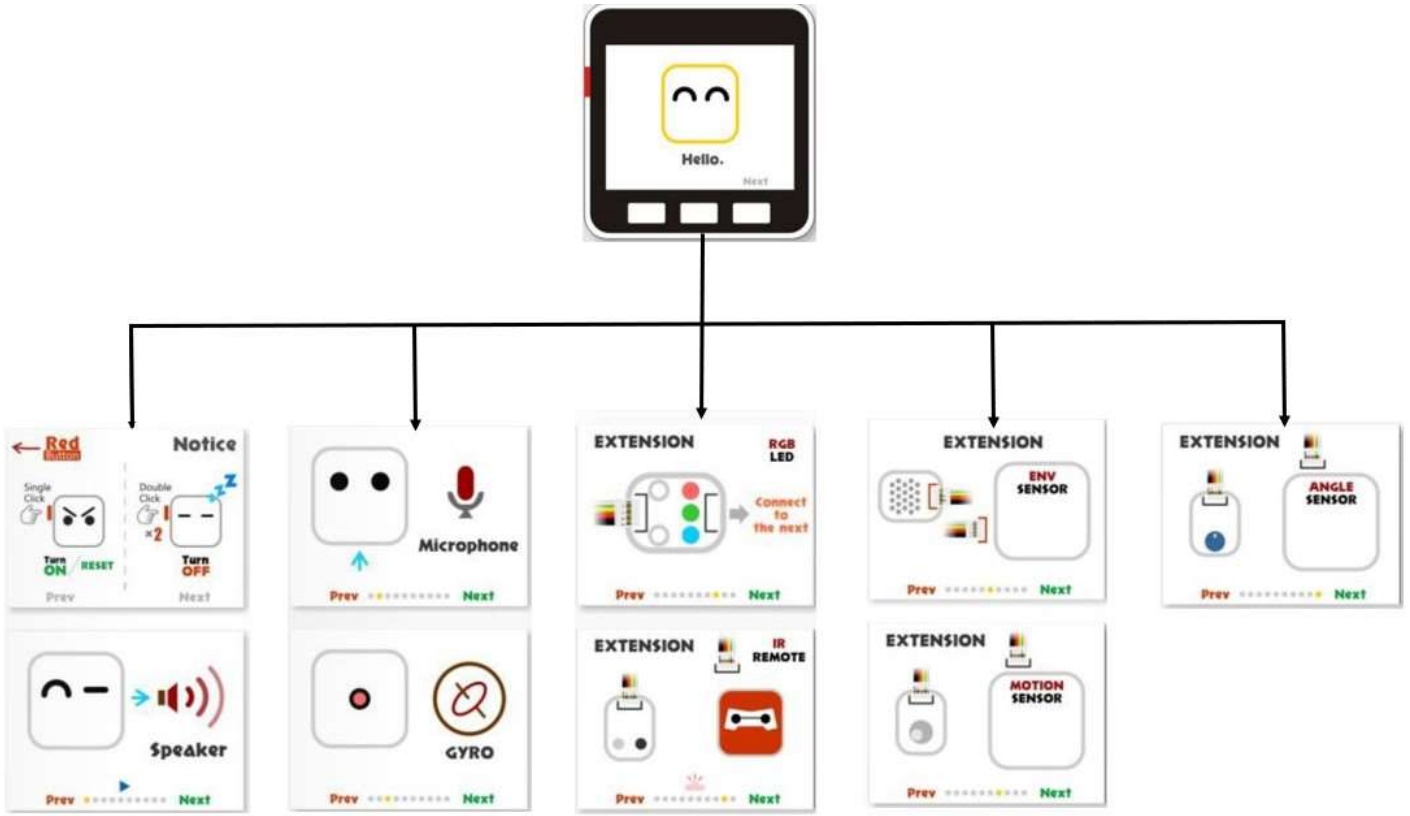
# Wearable Audible/Alert Devices Demonstrators


The following information is from the forth coming book title:




https://www.amazon.com/M5Stack-Electronic-Blueprints-interactive-applications/dp/1803230304/ref=sr_1_1?crid=OVYB3O0IQ5OU&keywords=dr.+don+wilcher&qid=1667169860&sprefix=%2Caps%2C191&sr=8-1

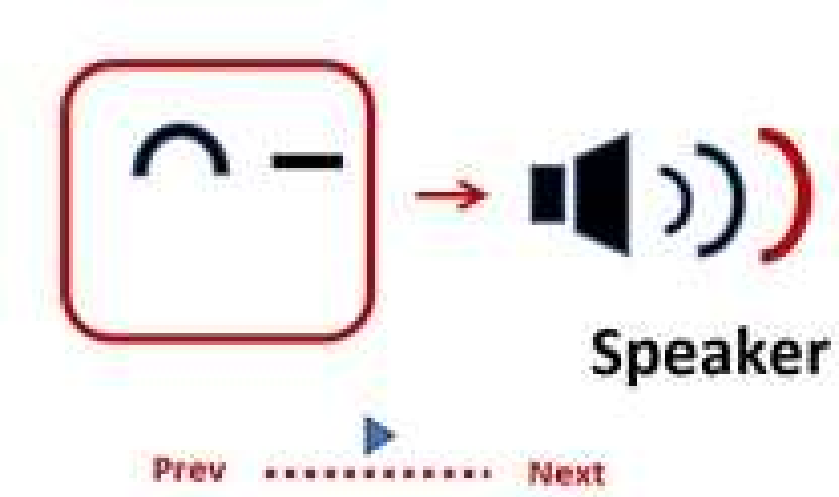
# M5Stack Demonstration Units

# M5Stack Demonstration Units. . .


## Examples of Functional UI Designs

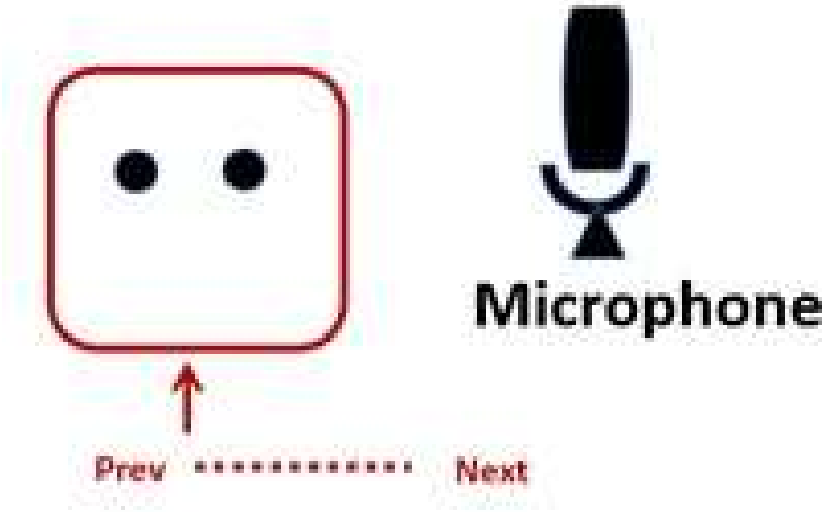
Demo 2 Speaker. Press the center button on the M5Stack Core to hear a sound from the internal speaker



# M5Stack Demonstration Units. . .


## Examples of Functional UI Designs

Demo 3 Microphone. Speak into the pinhole microphone located on the side of the M5Stack Core. While speaking into the microphone, observe the line and sound wave images.



# M5Stack Demonstration Units. . .


## Examples of Functional Audible/Alert Device UI Designs

Demo 4 Gyro. Tilt the M5Stack Core and observe the ball movement on the LCD screen. The movement is accomplished using a gyroscope and an accelerometer


Note: Use M5Burner to install the M5GO.py which has the Demo programs.

https://docs.m5stack.com/en/download

# M5Stack Demonstration Units. . .


## Examples of Functional Audible/Alert Device UI Designs

Demo 5 RGB LEDs. This demonstrator will glow and dim the sidebar RGB LEDs of the M5Stack Core. There is one LED bar on each side of the M5Stack Core:

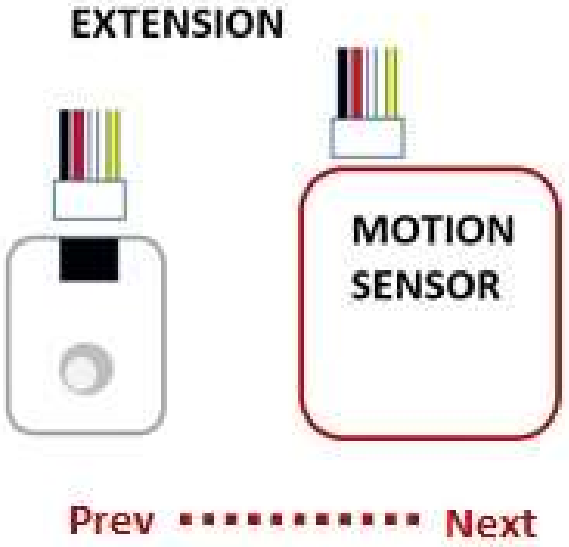

Note: Use M5Burner to install the M5GO.py which has the Demo programs.

https://docs.m5stack.com/en/download

# M5Stack Demonstration Units. . .


## Examples of Functional Audible/Alert Device UI Designs

Demo 8 Passive Infrared (PIR) Sensor. Attach the PIR sensor to extension port B of the M5Stack Core. You will observe a color change of the circle when placing your hand in front of the sensor. The color change response of the circle will occur with your hand placed away from the PIR sensor




Note: Use M5Burner to install the M5GO.py which has the Demo programs.

https://docs.m5stack.com/en/download

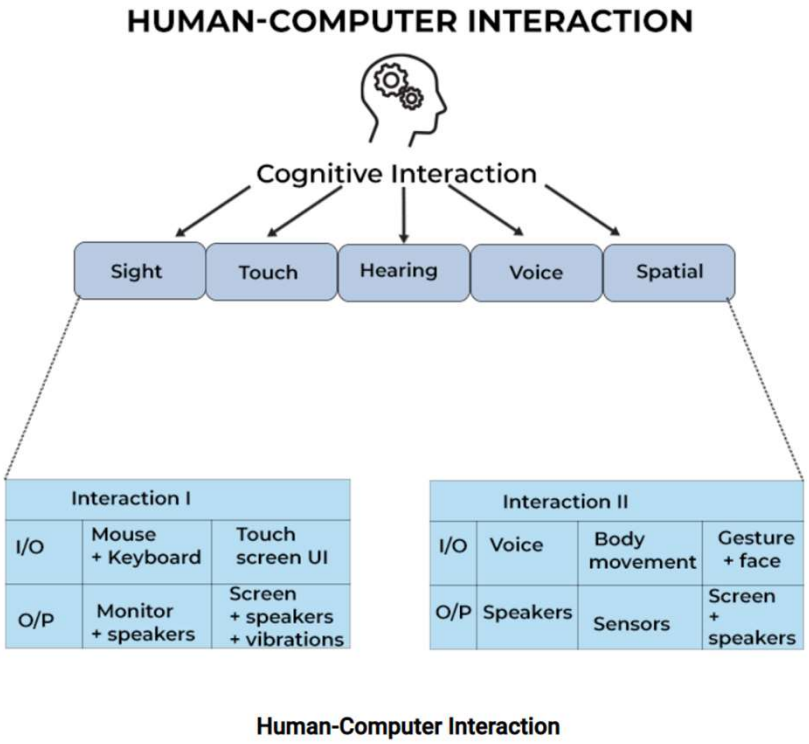
# Question 3

**In reviewing slide 17, which demonstrator will explore wireless control.**

**a) Notice**
**b) Extension**
**c) IR Remote**
**d) none of the above**

# What is Human Computer Interaction (HCI)?.

. .




Human-Computer Interaction


Segway to:

UI Design Basics

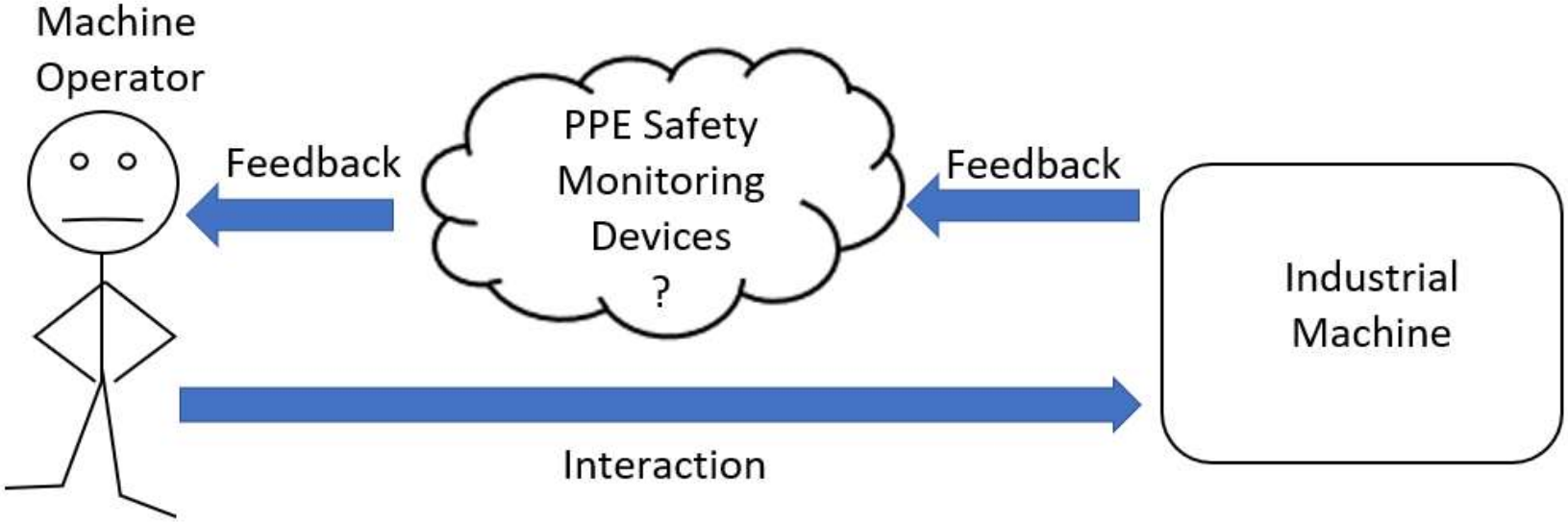
Kanade, V. (2022, July 22). *What is hci (human-computer interaction)? Meaning, importance, examples, and goals*. https://www.spiceworks.com/tech/artificial-intelligence/articles/what-is-hci/

# Lab: Wearable PIR-Motion Activated Alarm

# Lab: Wearable PIR-Motion Activated Alarm:

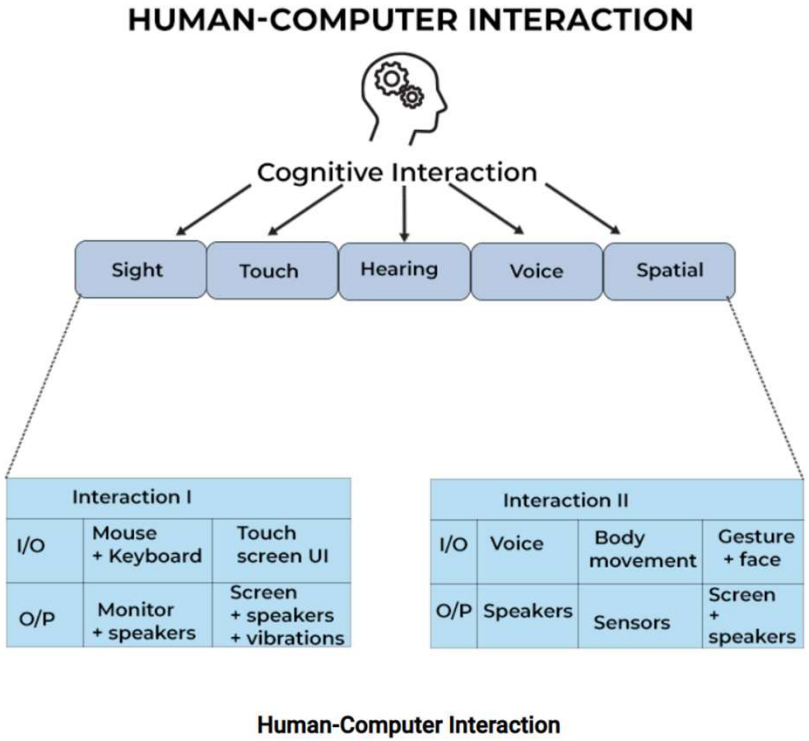

## Wearable Device Safety Concept Question

What types of wearable PPE Safety Monitoring devices can be deployed to the machine operator?



# Lab: Wearable PIR-Motion Activated Alarm:

## What is Human Computer Interaction (HCI)?. .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# Question 4

**In reviewing slide 27, which M5Stack Core unit best aligns with the Interaction II of Body Movement?**

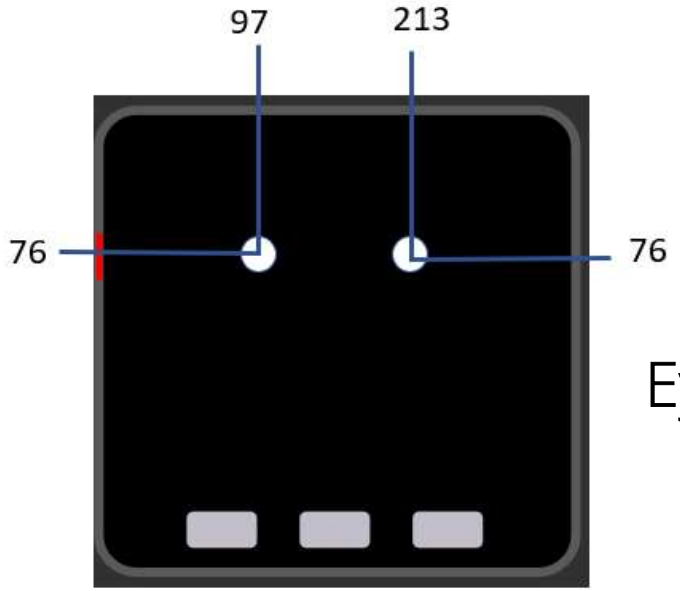
**a)Gyro**
**b)Motion**
**c)Angle**
**d)none of the above**

# Lab: Wearable PIR-Motion Activated Alarm. . .


## Big IDEAS (Learning Objectives):

1. The participant will be able to develop Blockly Code software for the M5Core ESP32 controller.
2. The participant will be able to program add an electronic unit to a blockly code project.
3. The participant will be able to setup communication with the M5 Core ESP32 controller.
4. The participant will be able to run an example PIR – Motion Detector.

# Lab: Wearable PIR-Motion Detected Activated Alarm. . .

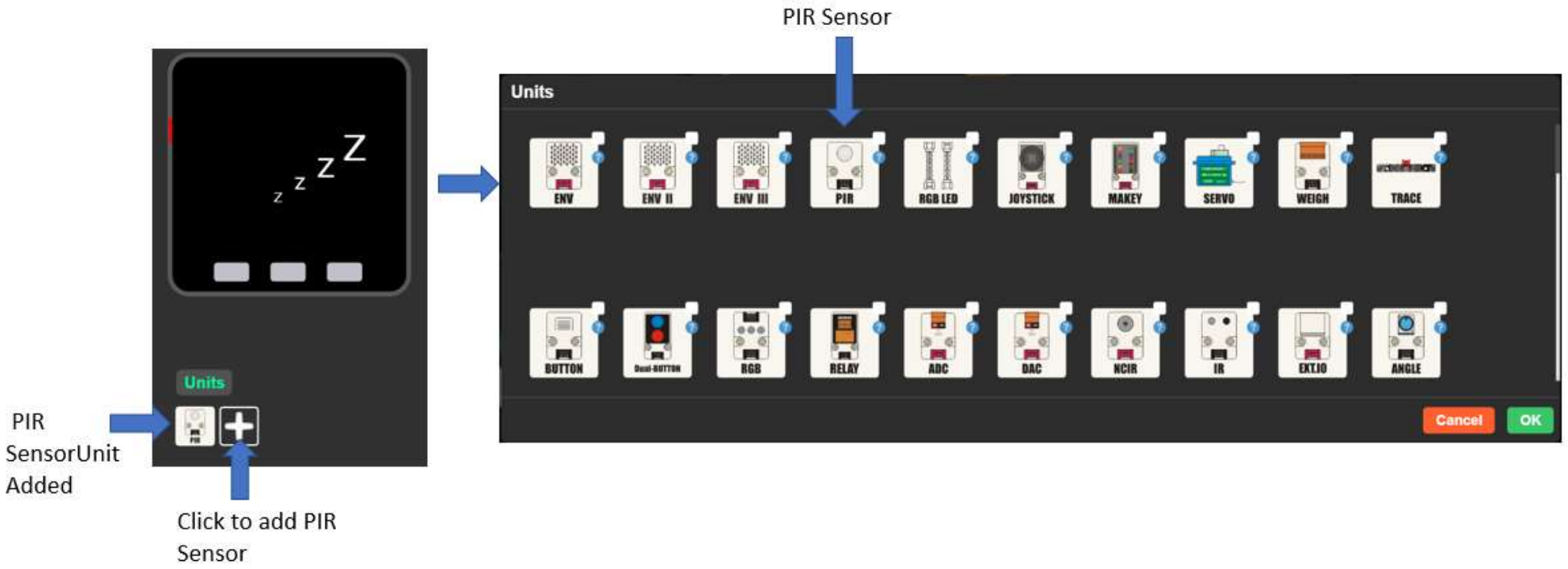




Eye Coordinates

PIR – Motion Activated Alarm UI

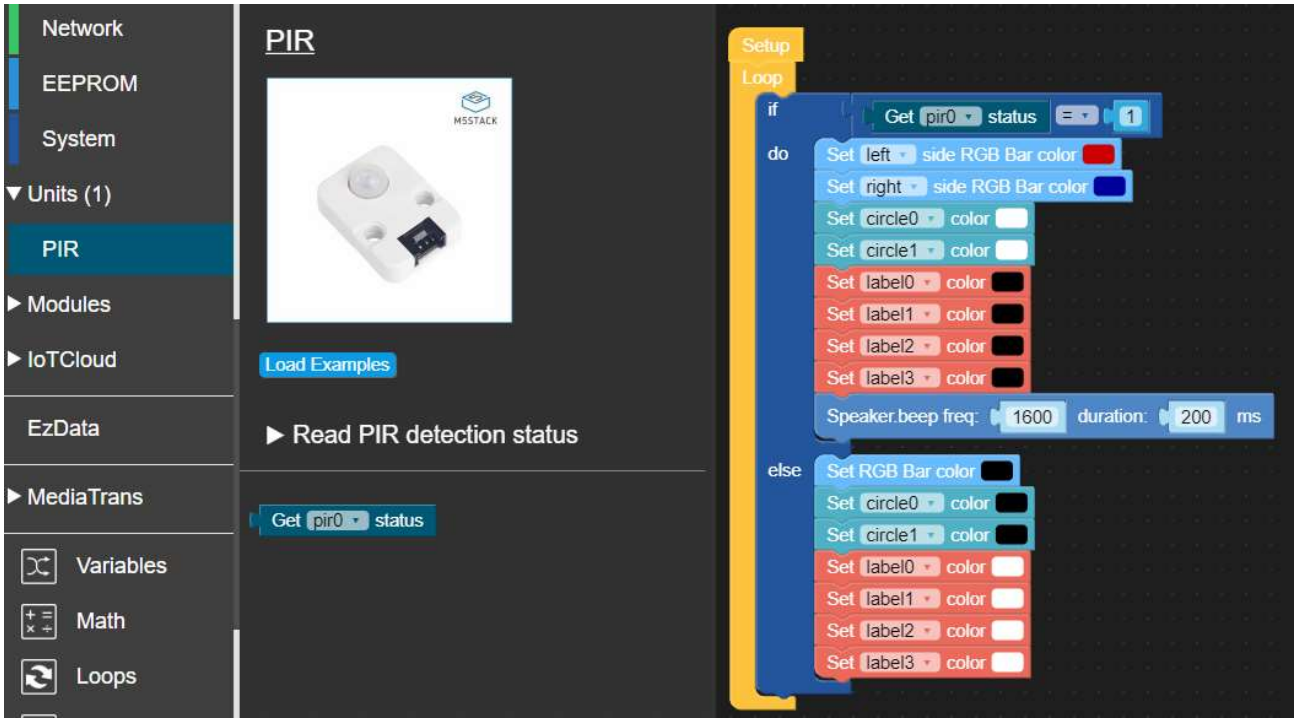
# Lab: Wearable PIR-Motion Activated Alarm. . .

## Adding PIR Sensor to Block Code project



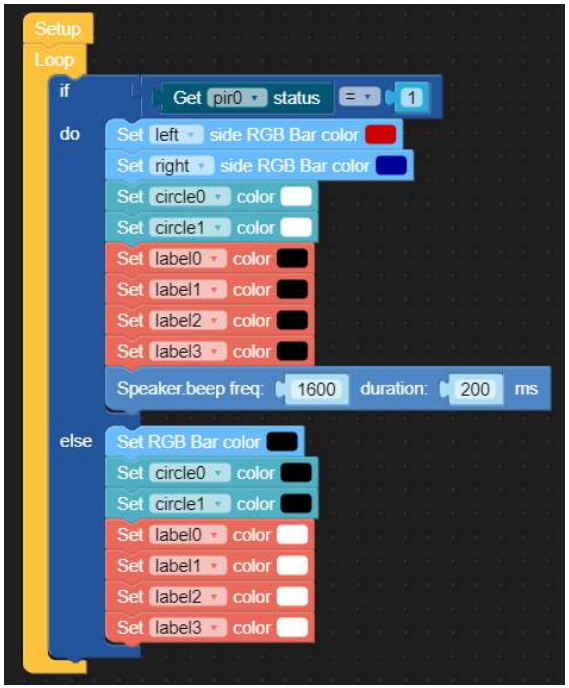
# Lab: Wearable PIR-Motion Activated Alarm. . .

## Wearable PIR-Motion Activated Alarm: Obtaining Blockly Code Blocks



# Lab: Wearable PIR-Motion Activated Alarm. . .


## PIR-Motion Activated Alarm: Blockly Code Blocks




Click Download Button to save and execute code blocks

# Lab: Wearable PIR-Motion Detected Activated Alarm. . .


## Operational PIR-Detected Activated Alarm


No Motion Detected

Motion Detected

# Lab: PIR-Motion Activated Alarm. . .

## Wearable PIR – Motion Activated Alarm: YouTube Video


https://youtu.be/CcdYCM8nKc4

# Question 5

**In reviewing slide 30, what UI element was used to create the eyes for the PIR-Motion Activated Alarm?**

**a) square**
**b) dot**
**c) circle**
**d) none of the above**

# Thank you for attending
## Please consider the resources below:

Bonfiglio, A , & De Rossi, D.(Eds). (2011). *Wearable monitoring systems.* Springer

Hartman, K. (2014). *Wearable electronics: Design, prototype, and wear your own interactive garments*. Maker Media.

Kanade, V. (2022, July 22). *What is hci (human-computer interaction)? Meaning, importance, examples, and goals*. https://www.spiceworks.com/tech/artificial-intelligence/articles/what-is-hci/

Klemmer, S. (2012). *Lecture 2- The power of prototyping|hci|*. https://www.youtube.com/watch?v=IyMT91wUO54

M5Stack Electronic Blueprints: https://www.amazon.com/M5Stack-Electronic-Blueprints-interactive-applications/dp/1803230304/ref=sr_1_1?crid=OVYB3O0IQ5OU&keywords=dr.+don+wilcher&qid=1667169860&sprefix=%2Caps%2C191&sr=8-1

Nash, M. (2017). Hci design and age groups. *HOHONU,15*, 39-43.

# Thank you for attending

## Please consider the resources below:

Rakes, C.D. (1998). *Alarms: 55 electronic projects and circuits*. Tab Books

Schon, S., Allaert, I., Frebel, L.,Guntram Geser, E.M, Hornung, V., & Vloet, F.(2020). *Making social innovators. Workshop design for and with young social innovators from 6 to 16years* (DOIT Handbook). Horizon 2020 project..

UiFlow Code download website:

https://shop.m5stack.com/pages/download.

Ulrich, K. T., Eppinger, S. D., & Yang. M.C. (2020). *Product Design and Development.* McGraw-Hill.

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