

# ISEIC'2022 Proposal Template

## A. Proposal Information

Project title	<b>Wirelessly controlled computer with gestures. (WCCG)</b>
Project Challenge Area	<b>Wireless communications/networks</b>
School / College / University	<b>Faculty of Engineering Cairo University.</b>
Department/Faculty (for University)	<b>Aerospace Engineering-Cairo University.</b>
Industrial partner (if any)	-

## B. Advisor Information

Advisor Name	<b>Eng. Hussein Hafez</b>
Title	<b>Teacher assistant at aerospace department.</b>
Work Address	<b>Faculty of Engineering Cairo University at Giza</b>
Mobile	<b>0 100 964 1396</b>
E-mail	<b><a href="mailto:hussien@eng.cu.edu.eg">hussien@eng.cu.edu.eg</a></b>
Brief summary of expertise	<ul style="list-style-type: none"><li>- An aerospace engineering graduate (2014).</li><li>- A researcher at aerodynamic system technology laboratory (2016).</li><li>- Trainee at Egyptair phase 1 and 2 (2017).</li><li>- Diploma in Embedded systems from AMIT.</li></ul>

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### C. Project Members Information

#	Full Name	year grade	Strengths (special skills and capabilities)	Mobile number	Email
1	Marco Gamal Fekri Suleiman.	2025 expected.	-Programming Python and C++. -Arduino and IoT. -Digital marketing and SEO. -Web development front-end. -Graphic design. -UX/UI design.	01286497098	<a href="mailto:marco.gamal69@gmail.com">marco.gamal69@gmail.com</a>
2					
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\* Please note that the first name will be referred to as the main **CONTACT PERSON** for the whole group.

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## D. Project Description

### 1. Overview

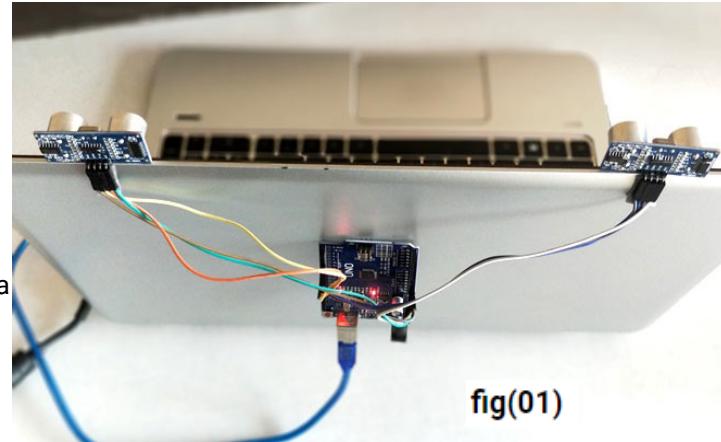
(i) Problem definition, (ii) approach and tools/techniques, and (iii) overview of system modules.

#### 1. Problem definition:

We all have seen Hand Gesture Controlled Robots, where the motion of a robot is controlled by the gestures of the hand. Another interesting project based on a similar principle is an Arduino based Hand Gesture Control with python on your computer or laptop.**fig(01)**

The problem on which the project focuses is the beginning of **using faraway gestures to control the computers**, I think it should be implemented as a futuristic control method on the new released laptops and computers rather than the traditional keyboard and mouse.

Human Machine Interface or **HMI** is a system comprising of hardware and software that helps in the communication and exchange of information between the user (human operator) and the machine.



**fig(01)**

We normally use LED Indicators, Switches, Touch Screens and LCD Displays as a part of HMI devices. Another way to communicate with machines like Robots or Computers is with the help of Hand Gestures.

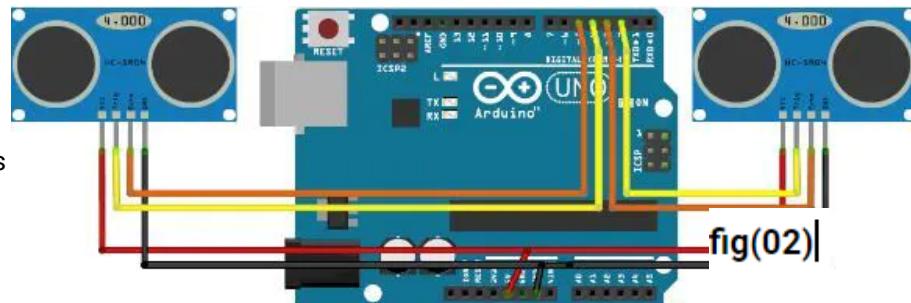
Instead of using a keyboard, mouse or joystick, we can use our **hand gestures to control certain functions of a computer like playing/pausing a video, moving left/right in a photo slide show, scrolling up/down in a web page and many more.**

In this project, I have implemented a simple Arduino based hand gesture control where you can control a few functions of your web browser like switching between tabs, scrolling up and down in web pages, shifting between tasks (applications), playing or pausing a video and increase or decrease the volume (in VLC Player) with the help of hand gestures.

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## 2. Approach and tools/ techniques:

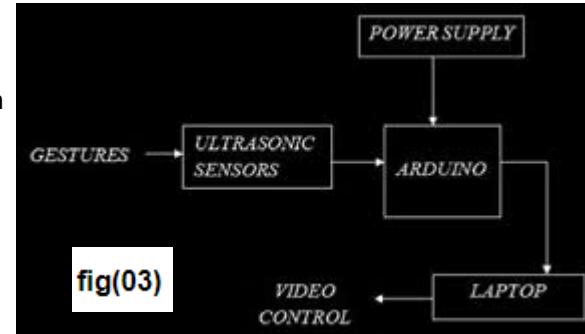
The principle behind the Arduino based Hand Gesture Control of Computer is to use two Ultrasonic Sensors with Arduino, **fig(02)**, place your hand in front of the Ultrasonic Sensor and calculate the distance between the hand and the sensor. Using this information, relevant actions in the computer can be performed.



The position of the Ultrasonic Sensors is very important. I have placed the two Ultrasonic Sensors on the top of a laptop screen at either end. The distance information from Arduino is collected by a **Python Program and a special library called PyAutoGUI** will convert the data into keyboard click actions.

### (iii) overview of system modules.

The block diagram of the Arduino part of the project is shown in **fig (03)**. It consists of an Arduino UNO board and two Ultrasonic Sensors and you can power up all these components from the laptop's USB Port.  
Arduino UNO x 1.  
Ultrasonic Sensors x 2.  
USB Cable (for Arduino).  
Few Connecting Wires.



The Trigger and Echo Pins of the first Ultrasonic Sensor (that is placed on the left of the screen) are connected to Pins 11 and 10 of the Arduino. For the second Ultrasonic Sensor, the Trigger and Echo pins are connected to Pins 6 and 5 of the Arduino.

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## 2. Impact

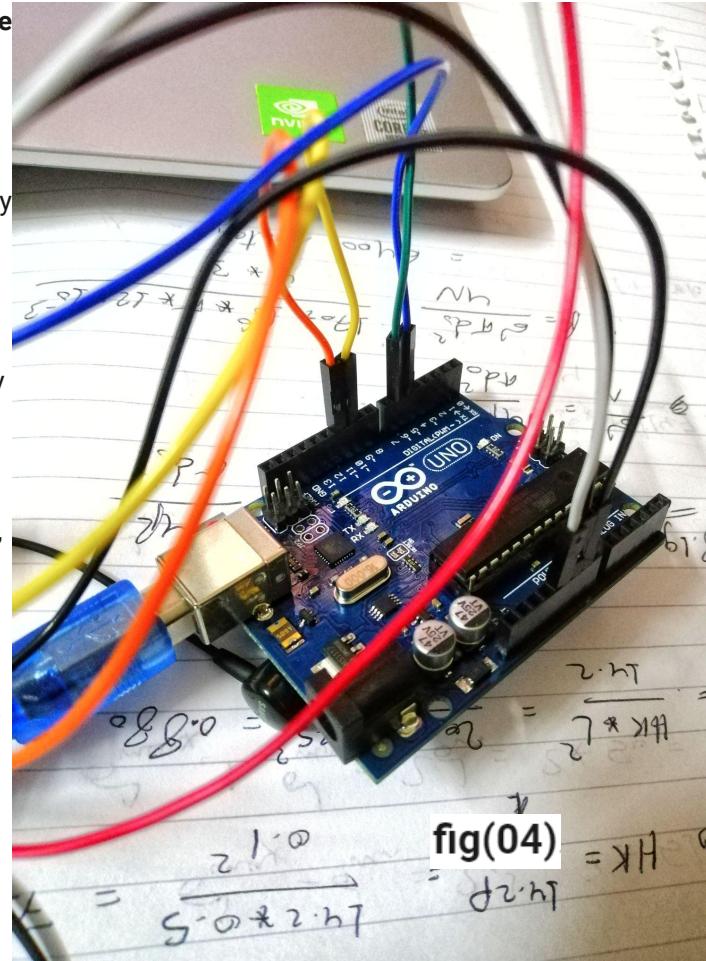
Why do you consider this project? What is its impact on community/market/end-user/...?

As technology trends to make human life easier and safer. So our main aim is to reduce the effort of interaction with computers through input devices using simple gestures. Scientists are trying to figure out how to change that and make digital interactions more human. One way they want to accomplish this is through gestures is shown **fig(04)**.

Computers should be "smart enough to reliably recognize non-verbal cues from humans in the most natural, intuitive way possible". Hand gestures are an important modality for human-computer interaction. Compared to many existing interfaces, hand gestures have the advantages of being easy to use, natural, and intuitive. Successful applications of hand gesture recognition include computer games control, human-robot interaction, and sign language recognition, to name a few. Vision-based recognition systems can give computers the capability of understanding and responding to hand gestures.

**My prototype is not so much intricate and intended to control some basic features of the computers, discussed above, that hierarchical marking menus can be used to develop gestural command sets.** However, so far, I have only designed the first example of a control gesture system for controlling some functions in computers and furthermore, we can work on **GESTURE-BASED APPLICATIONS** that focuses on enhancing the user experience.

This project is considered both applicable and not expensive for electronics companies to manufacture and sell it separately or add it as a feature into laptops and computers, hence it can achieve a significant impact on the market and users will find it both buyable and useful.



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### 3. Novelty and Features

Explain (i) novelty (ii) features, and (iii) related products, if any.

#### (i) novelty.

The hand gesture computers have been developed in the last couple of years and used in many applications like controlling videos played on VLC but my project is more developed to use hand gestures in shifting between different tasks in the computers and controlling google chrome.

The hand gestures in front of the Ultrasonic sensors can be calibrated so that they can perform five different tasks on your computer. Before taking a look at the gestures, let us first see the tasks that we can accomplish.

- Switch to Next Tab in a Web Browser
- Switch to Previous Tab in a Web Browser
- Scroll Down in a Web Page
- Scroll Up in a Web Page
- Switch between two Tasks (Chrome and VLC Player)
- Play/Pause Video in VLC Player
- Increase Volume
- Decrease Volume

#### (ii) features.

The following are the 5 different hand gestures or actions that I've programmed for demonstration purposes. As shown in **fig(05)**.

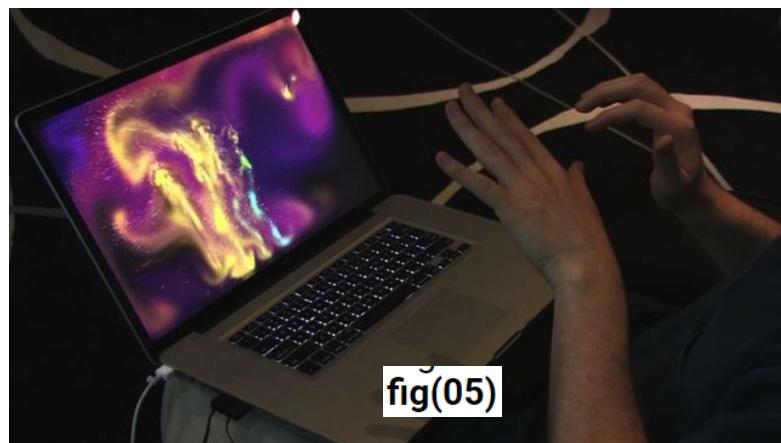
**Gesture 1:** Place your hand in front of the Right Ultrasonic Sensor at a distance (between 15CM to 35CM) for a small duration and move your hand away from the sensor. This gesture will Scroll Down the Web Page or Decrease the Volume.

**Gesture 2:** Place your hand in front of the Right Ultrasonic Sensor at a distance (between 15CM to 35CM) for a small duration and move your hand towards the sensor. This gesture will Scroll up the Web Page or Increase the Volume.

**Gesture 3:** Swipe your hand in front of the Right Ultrasonic Sensor. This gesture will move to the Next Tab.

**Gesture 4:** Swipe your hand in front of the Left Ultrasonic Sensor. This gesture will move to the Previous Tab or Play/Pause the Video.

**Gesture 5:** Swipe your hand across both the sensors (Left Sensor first). This action will Switch between Tasks.



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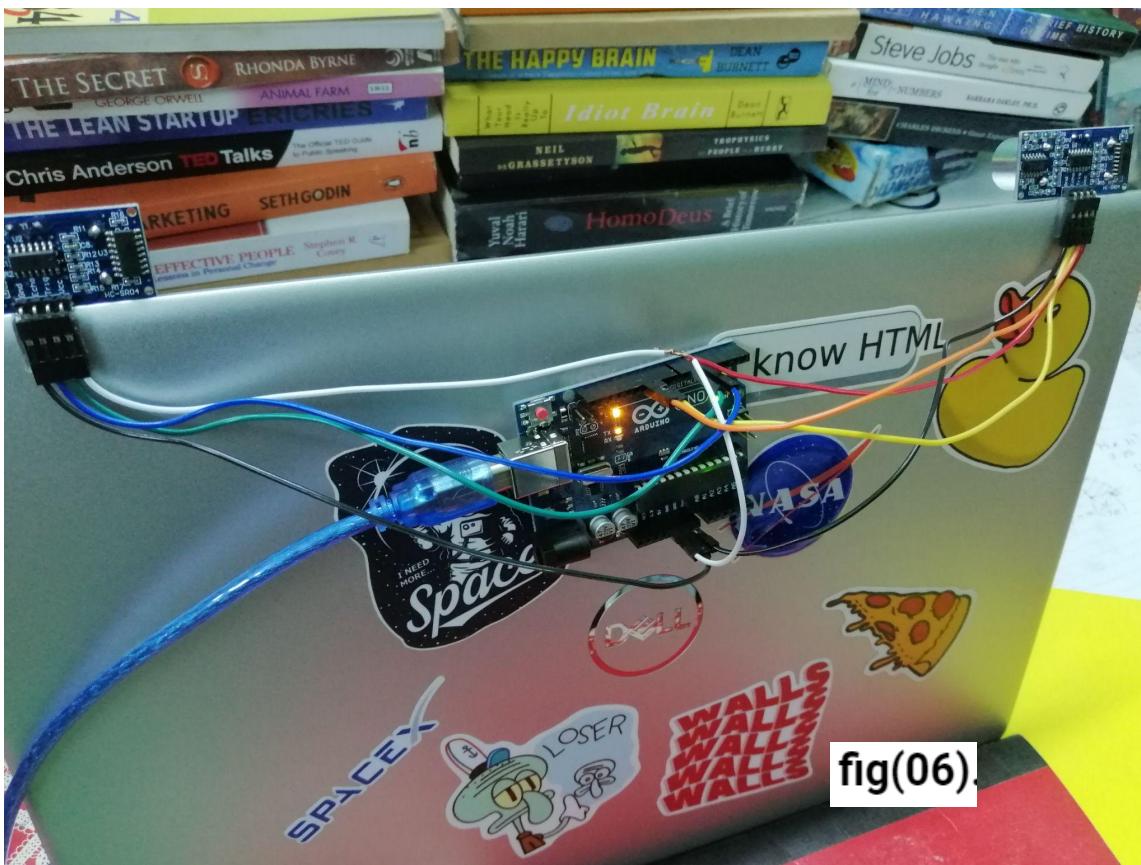
### 4. Deliverables

What is the project final outcome (HW device, SW package, simulation ...)? Do you foresee any potential marketing or customers?

**The final project outcome is to provide easy controlling gestures with the computers.**

This project is considered both applicable and not expensive for electronics companies to manufacture and sell it separately or add it as a feature into laptops and computers, hence it can achieve a significant impact on the market and users will find it both buyable and useful. As shown in **fig(06)**.

I also foresee that customers will find it a luxury but with a low price to use this hand-gesture system on their personal laptops and computers so it's so likely to achieve good market share among electronic devices.



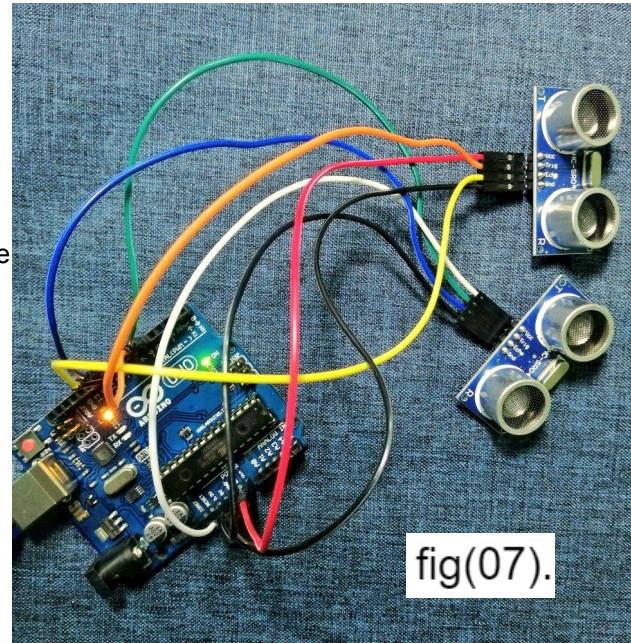
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## 5. Role of the Industrial Partner (if any)

What is the type of support to be provided by the industrial partner (technical, financial, access...)?

The wireless gesture prototype could be improved in technical and financial ways to come up with better results and long-term maintenance by developing its sensors and mechanism or materials.

1. An industrial partner could help make the hardware of the project more embedded and hidden inside the computer itself like any other hardware object contained in it. As shown in **fig(07)**.
2. It's preferred to use project the ultrasonic sensors of type **MA40H1S-R** shown in **fig (08)** which is a compact and low-profile configuration suitable for surface mounting. Transmission-reception combined type, allowing for distance detection in confined spaces. They are transmission- or reception-only and capable of both short- and long-range distance detection. In addition, they can be used to detect moving objects by making use of the doppler effect to detect fluctuations in the received waveforms.
3. Alternating the Arduino with printed circuit board inside the computer, powered and connected to the MA40H1S-R sensors.



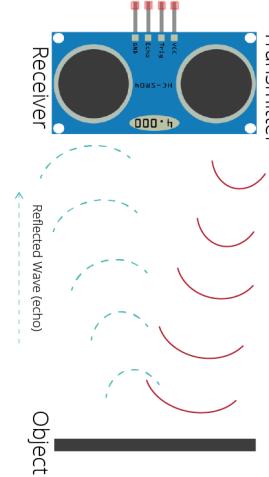
**fig(07).**

Part number	MA40H1S-R
Appearance	
Frequency	40kHz
Size	5.2×5.2mm, t=1.2mm
Features	Compact, suitable for surface mounting
Applications	<b>fig (08)</b> Distance detection and object detection

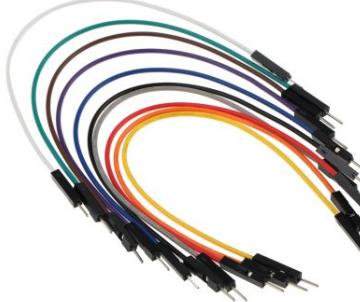
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<b>6. Estimated Expenses</b>							
An estimate of the itemized costs: Equipment & tools; printing (up to 10,000 LE)							
Item	Type (Hardware/ Software/ Other)	Specifications (brief description)	Justification (why is this item needed?)	Vendor/Source	Unit Cost	No. of Item s	Total Cost of Items
1	Arduino Uno	 <p>It's an open-source and extensible hardware and software to read the inputs from sensors(Ultrasonic sensors )and turn them into output.</p>	Used specifically in my project to read the inputs of 2 Ultrasonic sensors using the Arduino code written in C++ and convert that input into actual output (which is input in the python code)	<a href="https://ram-e-s hop.com/">https://ram-e-s hop.com/</a>	155 EGP	1	155 EGP
2	Arduino IDE software.	the software coding or integrated development environment on which the code is written and uploaded to the hardware (Arduino and ultrasonic sensors. )	Wrote and run the Arduino code part on it.	<a href="https://www.ar duino.cc/en/so ftware">https://www.ar duino.cc/en/so ftware</a>	free open source.	1	free.

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3	Ultrasonic sensors.	<p>The configuration pin of HC-SR04 is VCC (1), TRIG (2), ECHO (3), and GND (4). The</p>  <p>supply voltage of VCC is 5V and you attach TRIG and ECHO pin to any Digital I/O in your Arduino Board to power it.  <b>Specifications</b>  Power Supply: DC 5V  Working Current: 15mA  Working Frequency: 40Hz  Ranging Distance : 2cm – 400cm/4m  Resolution : 0.3 cm  Measuring Angle: 15 degree  Trigger Input Pulse width: 10uS  Dimension: 45mm x 20mm x 15mm.</p>	<p>Read the distance measured between the hand of user and the computer, and detect whether your hand in front of the Right or the left Ultrasonic Sensor at a distance (between 15CM to 35CM) for a small duration or even swiping it in front of the two sensors.</p> 	<p><a href="https://ram-e-s-hop.com/">https://ram-e-s-hop.com/</a></p>	40 EGP	2	80 EGP
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4	Jumper wires.	<p>jump wire (also known as jumper, jumper wire, jumper cable, DuPont wire or cable) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.</p> 	<p>Used to connect the sensors to the Arduino board (trig, echo, GND and VCC) to give the electric power to the sensor modules(GND, VCC) and transfer data (Echo, Trigger).</p>	<p><a href="https://ram-e-s hop.com/">https://ram-e-s hop.com/</a></p>	<p>20 EGP for the package.</p>	<p><b>10 wires</b></p>	<p>20 EGP for the package.</p>
5	Arduino code	<p>it's the C++ code language of the Arduino board.</p>	<p>you can preview my Arduino code here  <a href="#"> Arduino code..pdf</a></p>	<p>Written by me on Arduino IDE.</p>	<p>free</p>	<p>-</p>	<p>free</p>

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