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Smart Guide for Blind People Using Raspberry Pi

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ABSTRACT: The smart stick, constructed with at most accuracy, will help the blind people to move from one place to another without others help. This stick reduces the dependency of visually impaired people on other family members, friends while walking around. The smart stick detects objects or obstacles in front of users and feeds warning back, in the form of buzzer sound. We also are making an automatic document reader. It controls the peripherals like camera, a speaker which act as an interface between the system and therefore the user. Optical character recognition (OCR) technology is employed for the identification of the printed characters using image sensing devices and programming. It captures images of typed or printed text convert into machine-encoded text. Then converted into the audio format. Raspberry Pi is employed for the interpretation of printed document into data files using Tesseract library and Python programming. These data files are then computed by OpenCV library and Python programming language to urge the audio output.

KEYWORDS: smart stick, raspberry pi, ultrasonic sensor, optical character recognition.

I. INTRODUCTION

As derived from ―World Health Organization report and fact sheet updated on October 2017 on visual defect, the estimated number of individuals accept vision impairment is about 270.5 million; 49.1 million are totally blind while 221.4 million suffer from moderate to severe vision impairment [1][2]. Globally, the most explanation for vision loss is that the chronic eye diseases while the highest two causes of visual defect are in-corrected refractive errors and un-operated cataract. In this fast-moving world, visually impaired people are left behind and not treated equally. to assist them and supply them with some level of comfort, many solutions and techniques are tried and developed [3][5]. one among these techniques is named orientation and mobility. during this technique, a specialist helps the visually impaired and blind people and trains them to maneuver on their own. they're trained to depend upon their other remaining senses to maneuver independently and safely. In order to support blind and visually impaired people ‘s mobility indoor and outdoor, this work proposes an easy electronic guidance embedded vision system which is configurable and efficient [4]. The system utilizes three sorts of devices including ultrasonic sensor, accelerometer sensor and camera. A raspberry pi 3 b+ microprocessor processes the reflected signals from all devices so as to classify an obstacle. The proposed guidance device is in a position to work out the obstacle distance. There are many existing solutions to the matter of assisting individuals who are blind to read, however, none of them provide an efficient reading. We specialize in improving the competence of blind people by providing them with an answer where the small print is given within the sort of audio signal. Raspberry Pi-Based Reader is an automatic document reader for visually impaired people using OCR technology. The proposed project uses a camera-based assistive device which may be employed by individuals to read printed text. The scheme is to implement an embedded system-based image capturing technique using Raspberry Pi board. the planning is inspired by prior research with visually impaired people, that helps in achieving result in little setup. Here, we've suggests a text read out system for visually impaired people. OCR and Text-to-Speech synthesis is employed to convert images into audio output (Speech). The proposed apparatus features a camera which act because the data input device for digitization and this

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digitized script is processed by OCR (software module). A procedure is followed for recognition of characters and therefore the line of reading. within the context of software development, the Open CV (Open source Computer Vision) libraries are employed to capture image of text and character recognition. the ultimate identified text document is given to the output devices supported the selection of the user. Headset connected to the Raspberry Pi or a speaker act because the output device.

II. METHODOLOGY

The proposed project is implemented on the raspberry pi 3b+ board. Fig.1 shows the block diagram of raspberry pi based smart guide. It consists of raspberry pi 3b+, ultrasonic sensor, accelerometer sensor, camera, buzzer, earphone. Raspberry Pi is that the control unit which controls the whole system which activates ultrasonic sensor, accelerometer sensor and camera. When ultrasonic sensor is activated, it detects the object in front of it. When the camera is activated, it starts to capture image. [9][10] The printed text is to be placed under the camera to ensure the image of excellent quality and fewer distortions. Then an applicable blind-assistive system, an algorithm might prefer. It checks the supply of all the devices and also for the connection, when the applications start. Raspberry Pi 3 uses a Linux based OS named Raspbian. The first part is booting the Raspberry Pi board by installing the OS Raspbian OS and installing the essential libraries and packages.

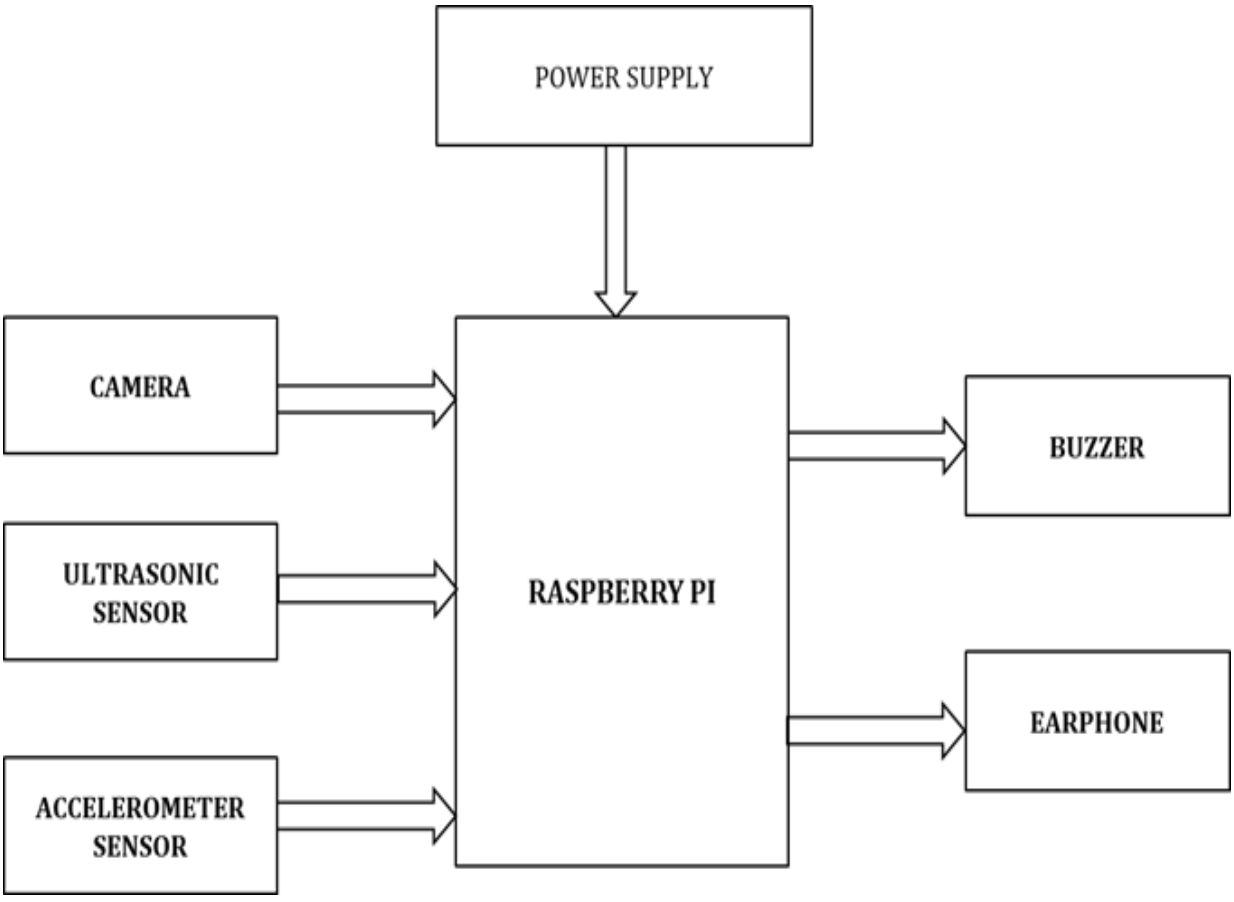

Fig 1: Block Diagram of Smart Guide

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III HARDWARE IMPLEMENTATION

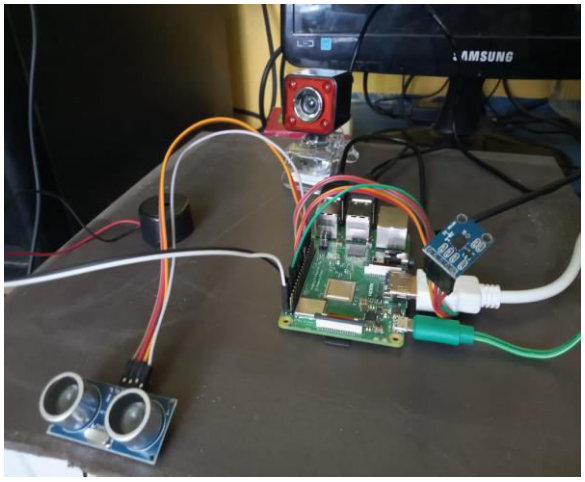

Fig 2: Hardware connection

Fig 3: Smart guide

Fig.4. Ultrasonic sensor

Fig.5. Camera

Fig.6. Accelerometer sensor

Fig.7.Raspberry pi 3 b+

Fig.8. Buzzer

POWER SUPPLY

Fig.9. Earphone

Fig.7. shows the main processor of the system. It acts as a control unit which controls the ultrasonic sensor, accelerometer sensor, camera, buzzer. The remaining components are working under the following condition. **Fig.8.** shows the image of the buzzer we installed in our stick.

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Table.1. Function of ultrasonic sensor

ULTRASONIC SENSOR	OUTPUT
If the object is less than or equal to 50cm In distance.	It gives alert signal.
If the object is greater than 50cm in distance.	It gives safe signal.

Fig.4. shows the ultrasonic sensor which is operating under the above condition **Table.1.** The above table shows that the if the range of the object is less than or equal to 50cm, the buzzer gives the alert signal for the user. Otherwise, it doesn't give any signal.

Table.2. Function of accelerometer sensor

ACCELEROMETER SENSOR	OUTPUT
If the y-axis of the stick is 500<=y>=520	It gives safe signal.
If the y-axis of the stick is not less than 520 or not greater than 500	It gives alert signal.

Fig.6. shows the accelerometer sensor. The function of the sensor is mentioned in above **Table.2.** This table shows that the if the y-axis of the stick is less than 520 or greater than 500, it doesn't give any signal. But, if not the buzzer signal is activated.

Fig.5. and **.9.** shows the image of the camera and earphone. Both are act as a reading guide for the user. The camera takes photo continuously with certain time gap. If the text word in the captured image is identified clearly, then the text word is converted into audio format. The user can hear the audio formatted word through earphone. If the text word in the captured image is not clear or no text word on the image, there is no voice produced.

IV. WORKING

The system consists of a walking stick including a USB camera, Accelerometer, Ultrasonic sensor, Raspberry pi and a head phone attached to it. The raspberry pi is the microprocessor of the system. The raspberry pi allows the ultrasonic sensor to continuously measure the distance of the obstacles appearing across it. The ultrasonic sensor calculates the distance by using the time taken for ultrasonic waves to reach and reflect from the obstacle. If the obstacle is within 50cm range, then the ultrasonic sensor sends signal to the raspberry pi. Then raspberry pi enables the USB wired camera attached to it. When the camera is activated, it captures the image appeared in front of it. The captured image is also sent to Whole of this process is programmed in Python programming language. Because of these features the blind people able to move from one place to another independently.

Based on the image, we can see cleared that the output came exactly what the camera captured with the help of raspberry pi. The text image captured using python programming is converted into machine-encoded text. This encoded text is feature converted into audio output. Smart stick position XYZ level, if it goes less than 500 or greater than 520 automatically it gives alert through GIO buzzer.

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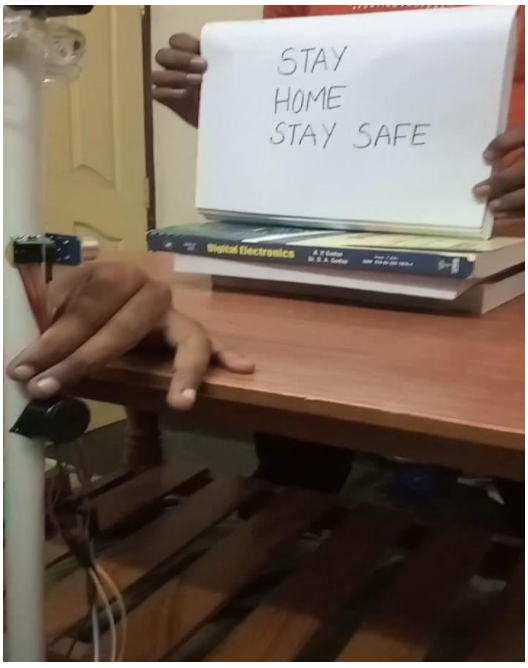

Fig.10.Camera fixed in the stick take photo in front of it

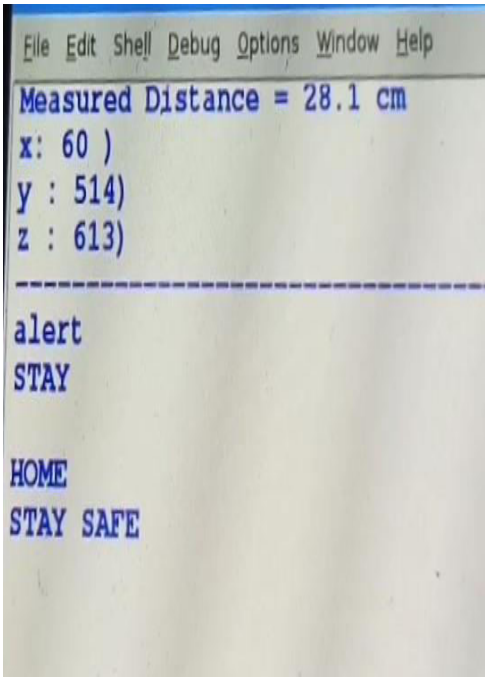

Fig.11.Captured image convert into text format

4.1.FLOWCHART

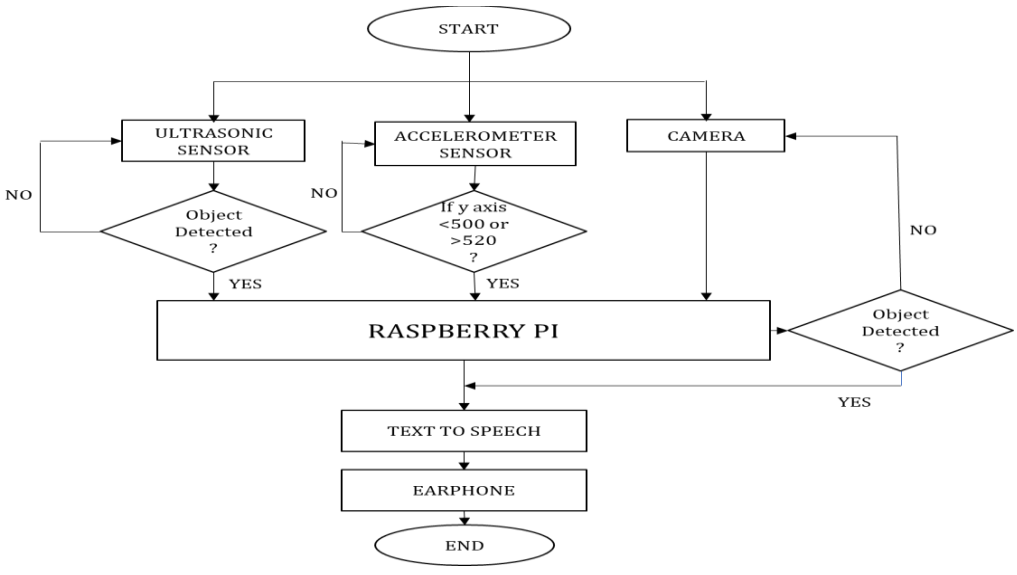

Fig 12: Flowchart of object detection

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Fig.12. shows the flowchart for the Smart guide system. The flowchart shows the sequence of steps and decisions required to perform the Smart guide system process. The camera is considered the eye of this system. It continuously captures still images which are sent to the raspberry pi microprocessor. Ultrasonic sensor is placed in the stick which is used to calculate the distance between the user and an object located at a distance. Then it gives signal to the user. Accelerometer sensor is also placed in the stick which is used to calculate the angle of the stick. That indicates the user is safe or not. It calculates the y axis of the stick. If the y axis value is less than 500 or greater then 520, it gives alert signal. Both of these sensors send the data to raspberry pi which in turn processes the data and sends the desired output. This again takes text as an input and converts it to an audio response which reaches the user through headset. This full process keeps going simultaneously and continuously until the user decides to switch off the device.

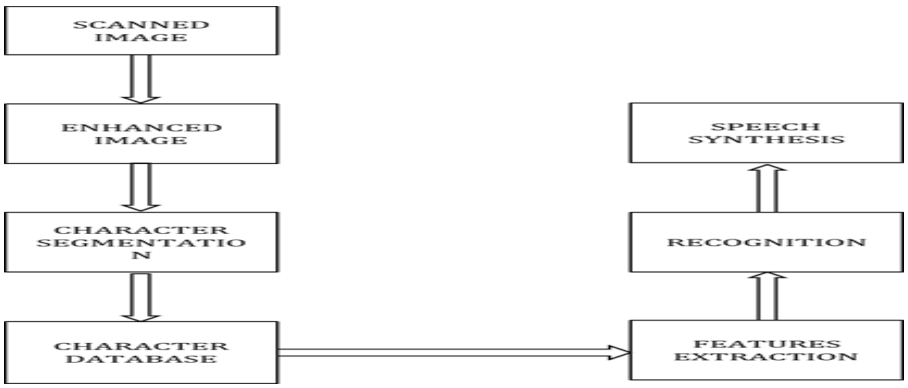

Fig 13: Flow of process

Fig 13. Shows the flowchart of the word reading process. The optical Scanning process involves capturing a digital image of the first document. The OCR optical scanners that are used will convert the sunshine intensity into gray-levels. This process is named as Thresholding. It converts a multilevel image into a bi-level image of black and white. Segmentation involves isolation of characters or words. Location of the text is completed via pixels with x and y coordinates. The resulting image from the method of scanning may contain some amount of noise. counting on the resolution of the scanner the characters could also be broken or smeared. Hence pre-processing is often done to smooth the digitized character. additionally, to smoothing pre-processing also involves normalization of the characters. This technique is employed for capturing the essential characteristics of the symbols. Feature extraction is completed by matching the matrix containing the input character with a group of prototype characters that represent each possible class. the popularity is that the process of identifying each character and assigning it to the right character class.

V. RESULTS & DISCUSIONS

The main function of the system is that it helps the blind people in both indoor and outdoor. The devices placed in the stick makes it comfortable and easy to handle for the user. The smart stick helps in detecting objects placed at a distance of 50cm in front of the user. The system is suitable for both indoor and outdoor environment. The information regarding obstacles is given through buzzer alerts. The system is a moderate budget and weightless for the user.

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Fig 14: Camera capture image

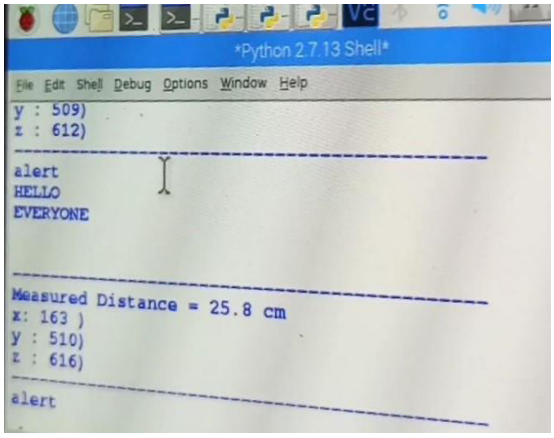

Fig 15: Captured image convert into text

VI. CONCLUSION

This gadget may be a very practical creation which helps blind users by acting as his auxiliary senses. it's no-nonsense design which is only focused on general usage. Even for mass production, it doesn't require heavy machinery. Based on the above facts we will confidently conclude that: The smart stick may be a simple, cheap, easy to handle electronic guidance device, which is proposed to supply constructive assistant and support for blind persons.The device specifying the source and distance of the objects which will be encounter by the blind. it's ready to scan areas left, right, and in front of the blind man no matter its height or depthIt's a user-friendly device and may serve the aim of potential beneficiaries.

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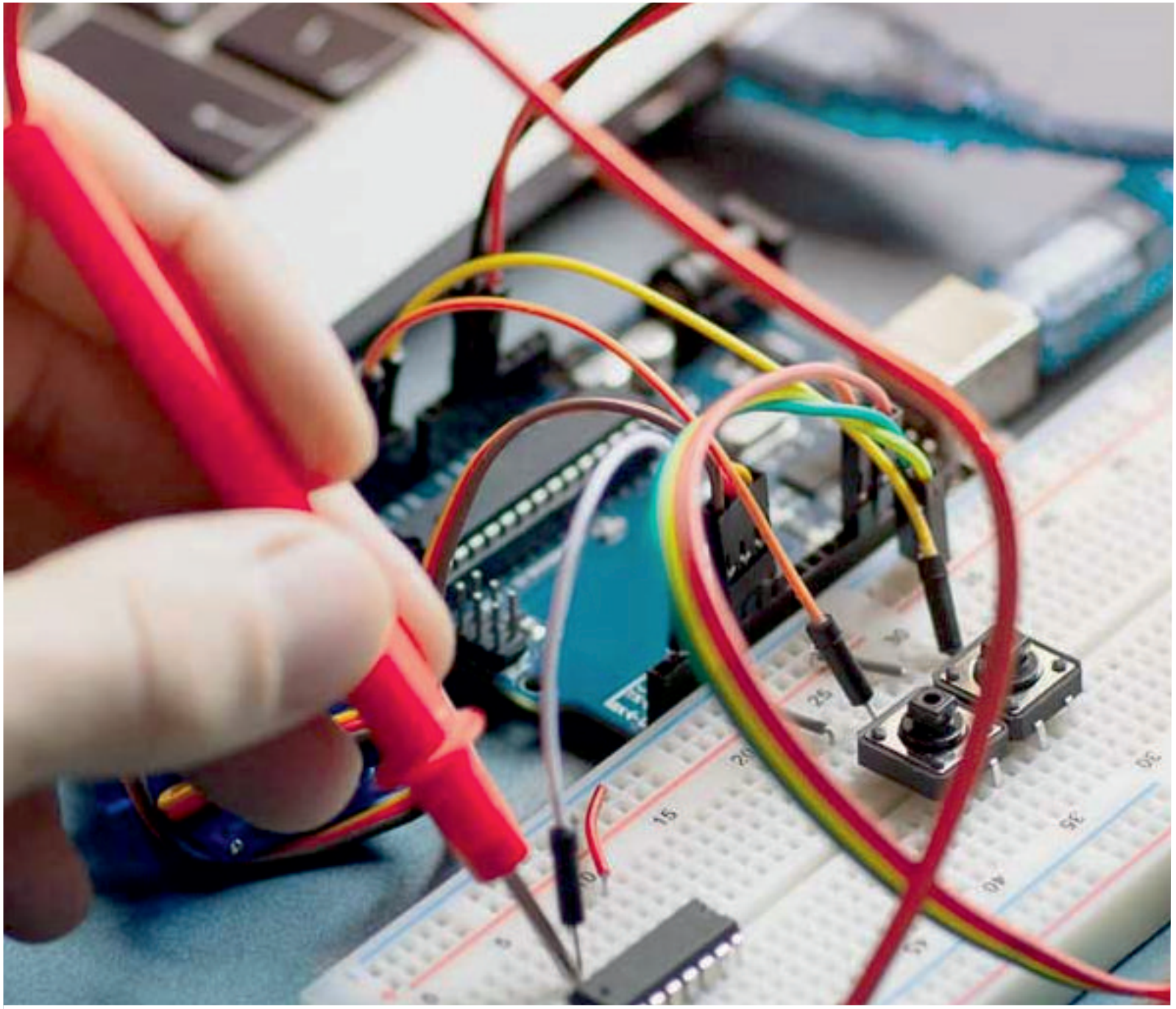

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