iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** IV **Month of publication:** April 2022

DOI: https://doi.org/10.22214/ijraset.2022.41267

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue IV Apr 2022- Available at www.ijraset.com

A Review Paper on Health Monitoring Smart Mirror

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Abstract: ***A variety of environmental factors can obstruct human health and well-being. These challenges include chemical pollution, air pollution, climate change, disease-causing bacteria, a lack of access to health care, poor infrastructure, and poor water quality.***
What we need now is a mechanism to continuously monitor an individual's health in an intuitive approach that can be used regularly without too much effort.
That's why we're proposing to create a smart mirror that can track a user's health. The smart mirror will monitor and display your heart rate, oxygen level, and body temperature.
Keywords: Internet of Things (IoT), Smart Mirror, Arduino.

I. INTRODUCTION

For health monitoring, a variety of approaches are available, as well as a variety of sensors. Early health monitoring approaches were clinical, in which people could learn to manage certain physiological functions by changing the beliefs and perceptions that caused them with the help of skilled therapists, but they had to travel to specific sites where the technology was available. Individuals can now utilize biomedical sensors and the Internet of Things to keep track of physiological functioning from afar (IoT). Sensors are used in a variety of gadgets, including phones, watches, and other electronic devices. For individuals who are capable of using such devices, this technology is incredibly valuable. Elderly individuals, on the other hand, who are less able to use such equipment, require health monitoring systems more than persons of other ages. This chapter explains how to use mirrors to create an effective health monitoring system that can be used by anyone of any age. The physiological data is collected by the biomedical sensors in the mirror and communicated to medical personnel so they can learn more about the patient's health. Doctors can keep an eye on their patient's health from afar using this method.

In this study, we focused on a smart mirror, which is one of these gadgets. A smart mirror is an electronic device that functions as a mirror but can also communicate with users and display information such as date, time, and weather on the screen, all while being hidden behind a reflecting surface. Smart mirrors come in a variety of shapes, sizes, and applications that can be used in academic, general, and medical settings using various implementation methods and programming languages.

Previously, the smart mirror served only as an interface for displaying generic information. By integrating a sensor placed inside the smart mirror, the mirror can now predict the presence of the user in front of it, making it more interactive. Smart mirrors display data that is useful to every user. It's useful in a variety of situations. In the fashion industry, for example, the mirror may act as a consultant, guiding consumers through a simulation to assist them to choose their attire. Furthermore, one of the most important fields that use the smart mirror to deliver therapeutic and medical advice to patients is medicine. Smart mirrors are also employed as a learning aid for pupils.

There are a variety of health monitoring strategies available and many types of sensors that can be employed. Early health monitoring techniques were clinical, in which a person could learn to control specific physiological functions by changing the thoughts and perceptions that produced them with the help of trained therapists, but people had to travel to specific locations where the technology was available.

Individuals can now employ biomedical sensors to remotely monitor physiological functioning via the Internet of Things (IoT). Sensors are used in a variety of gadgets, including cell phones, watches, and other wearables. For individuals who can use such devices, this technology is quite beneficial.

Elderly persons, who are less able to operate such equipment, require health monitoring systems at a higher rate than other age groups. This chapter provides a basic health monitoring system based on mirrors, which may be used by anyone of any age. The physiological data is collected by biomedical sensors in the mirror and communicated to medical personnel to provide them with information about the patient's health status. Doctors can use this method to remotely monitor their patient's health.

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II. INTERNET of THINGS (IoT)

The Internet of Things (IoT) is a phrase for physical items that can connect to and share data with other devices and systems over the Internet or other communication networks. It includes sensors, computing power, software, and other technologies. The term "internet of things" is deceptive because devices do not need to be connected to the public internet; instead, they must be connected to a network and addressed separately. Because of the convergence of several technologies, including ubiquitous computing, commodity sensors, increasingly powerful embedded systems, and machine learning, the field has progressed. The Internet of Things can function both independently and collectively thanks to traditional disciplines like embedded systems, wireless sensor networks, control systems, and automation. Lighting fixtures, thermostats, home security systems, cameras, and other home appliances that can be controlled by devices linked to that ecosystem, such as smartphones and smart speakers, are all items that contribute to the consumer market's embrace of the "smart home" idea. In healthcare, the Internet of Things is also used.

III. LITERATURE REVIEW

1) **S**mart Mirror Based on Raspberry pi in IEEE paper was projected in 2018 by Yong Sun, and Ke Dan. Time, date, temperature, speech recognition, and weather data square measure the first options lined during this study concerning good mirrors. The system's main disadvantage is that it uses numerous hardware, like a low-power CMOS period clock chip and an SYN6288 speech synthesis chip, that raises the value of the mirror. The system has no safeguards in situ.
2) New Kinpo cluster introduced Hi-Mirror, a smart mirror, in 2017. The camera during this good mirror checks the health of your skin. The mirror can scan your skin and provides you with a score that will tell you what you wish to boost. The mirror uses biometric identification to trace the firmness, texture, clarity, brightness, and health of a user's skin on a routine.
3) Smart Mirror for Smart Life in IEEE paper was projected in 2017 by, Shahreen Hassan, and Muhammad. Time, date, weather, warning, traffic, and position map square measure the first components lined during this paper concerning good mirrors. With the assistance of technology, it's doable to produce the listening feature offline. For a hot word, you'll invariably offer an Associate in Nursing offline listening performance. Once a hot word is discovered, it's sent to the user's voice recognition cloud service, once that the findings square measure received. The technology failed to perform as planned once it came to voice settings, and there's no security.
4) Smart Mirror Application with Raspberry Pi in IEEE paper was projected in 2017 by Fatma we tend to found the subsequent functions with the utilization of microcontrollers, raspberry pi, python, and javascript via signal processing: show weather data, time and placement, current event, and user data on the mirror. There square measure some flaws, like the very fact that just some are often operated by voice commands, and there's no security.
5) IoT-based Smart Mirror using Raspberry Pi in IEEE paper was projected in 2018 Conference proceedings of IJERT by Lakshmi NM, MS, P. The mirror has all of the quality practicality, like displaying the date and time, news, and weather. The malefactor detection module, which is supposed to capture numerous malicious acts within the house, is another performance featured during this mirror. The DHT22 sensing element is joined to the Raspberry Pi's GPIO pins to point out the temperature, however, this is not necessary as a result of the weather detector module using identical principles.

IV. COMPONENTS

1) *Arduino:* Arduino is an open-source sophisticated microcontroller that may be consistently used in a system. It can be utilized for low-voltage applications ranging from 3.3 to 5.5 V. It is utilized to provide electricity to solar panels. The universal serial bus is used to connect Arduino to a laptop or computer (USB), Arduino mostly uses C and C++ language principles. The user can utilize Arduino to make numerous modifications in IoT utilizing various programming languages.
2) *Temperature Sensor:* We'll be using a GY-906 MLX90614 Non-Contact Precision Thermometer for this project. It's a high-precision infrared non-contact thermometer module with an I2C interface that runs on either 5V or 3.3V. The key distinction between this thermometer and most others is that it takes temperature readings without contacting the object whose temperature is being checked. This is useful for monitoring the temperature of moving items, such as a spinning motor shaft or objects on a moving conveyor. The sensor can read a wide range of temperatures since it is not always exposed to the same temperature that it is monitoring. A built-in optical filter on the sensor blocks out visible and near-infrared light to reduce their impact on the measurement. It can use the I2C bus to communicate temperature or modify settings. It can continuously convey the temperature using a PWM signal, with the duty cycle of the signal representing the temperature. It can be used as a thermal switch to toggle the output at a pre-programmed trip point, such as in a thermostat.

3) *Pulse Oximeter Heart Sensor:* MAX30100 is being employed during this project it is a sensing element that has a pulse measuring system and a vital sign monitor. It's an associate optical sensing element that gets its measurements by emitting 2 wavelengths of sunshine – red and infrared – from 2 LEDs, then police investigate the absorption of pulsing blood with a photo-detector. This LED color combination is good for reading information with the tip of one's finger. The digital output information is held on in a very 16-deep inventory accounting inside the device, and it's customizable through code registers. It connects to several microcontrollers through an associate I2C digital interface. Close lightweight cancellation (ALC), a 16-bit letter of the alphabet delta ADC, and a proprietary distinct temporal filter compose the heartbeat oximetry scheme within the MAX30100. It operates at extraordinarily low power, creating it excellent for powered systems. The MAX30100 needs an influence offer starting from one.8 to 3.3 volts. wearable gadgets, fitness help devices, medical observation devices, and alternative devices will all have the benefit of it. The MAX30100 runs on one.8V and 3.3V power sources, and it's going to be turned down by code with little or no standby current, permitting the facility offer to be connected the least few times.
4) *Smart Mirror:* A Smart Mirror is a two-way mirror with a built-in display on the backside of the glass. On the mirror's surface, the display can show the current time, weather forecast, news feed, scheduled appointments, and more. The capacity to display any information you choose on a Smart Mirror is what makes it "smart." Local weather forecasts, news bulletins, your forthcoming calendar agenda, social network feeds, and other information can all be displayed on a smart mirror. You may easily design a smart mirror to display whatever information you desire.

V. BLOCK DIAGRAM

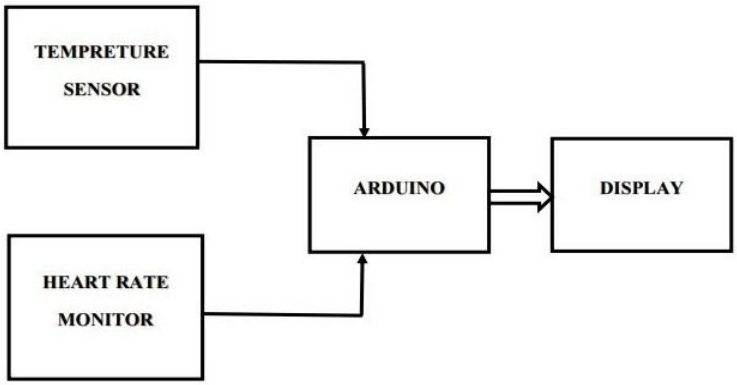

Fig: Block Diagram of Health Monitoring Smart Mirror

VI. APPLICATIONS OF SMART MIRROR

1) A smart mirror that serves as a personal assistant to address the problem of time management that many people experience. It shows time, weather, and news, among other things. Users can browse and change daily schedules for numerous users, as well as read and reply to emails. The mirror also has a graphical keyboard that users can use to interact with it.
2) A smart mirror for use in smart home communications. This smart mirror is significant because it is efficient, intelligent, safe, and reasonably priced. In addition, we created this smart mirror using the unidirectional photography idea. In general, the results demonstrated that the smart mirror improves safety by comparing the user's face to previously recognized faces and sending an alarm if non-conformity to the owner status occurs.
3) The system was created with either an Arduino Uno or a Raspberry Pi. A plasma panel was also used to display some system capabilities such as face and voice recognition, speech playback, remote control, Wi-Fi connectivity, and a clothing indicator. The control module, display module, clock module, wireless transceiver module, and Bluetooth module all made up the smart mirror. In general, the findings revealed that a low-cost smart mirror may be created utilizing simple materials and an Arduino Uno or Raspberry Pi.
4) A smart mirror that acts as a virtual fashion adviser, analyzing, estimating, and recommending appropriate attire and outfits. Users have been guided to figure out what to dress using AR and gesture recognition under fashion directions. In 2d visualization, there are also icons to choose the outfits.

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5) FitMirror, a smart mirror, was invented as an interactive gadget to improve the user's mood and motivation while also having a good effect on the user's feelings. FitMirror also encourages users to get up and work out first thing in the morning. In addition, the mirror was linked to the Android Fit program, which displayed the users' exercise data, as well as their pressure and stress levels, over a week. Touch or voice are two ways in which the user can communicate with the device.

6) An automatic personal cosmetics system was created with the help of a smart mirror. The device uses a smart mirror to identify makeup aspects that are best suitable for a user's face by applying them to facial photos. Furthermore, the system was constructed using Machine Learning (ML) and AI approaches during the analysis of users' faces.

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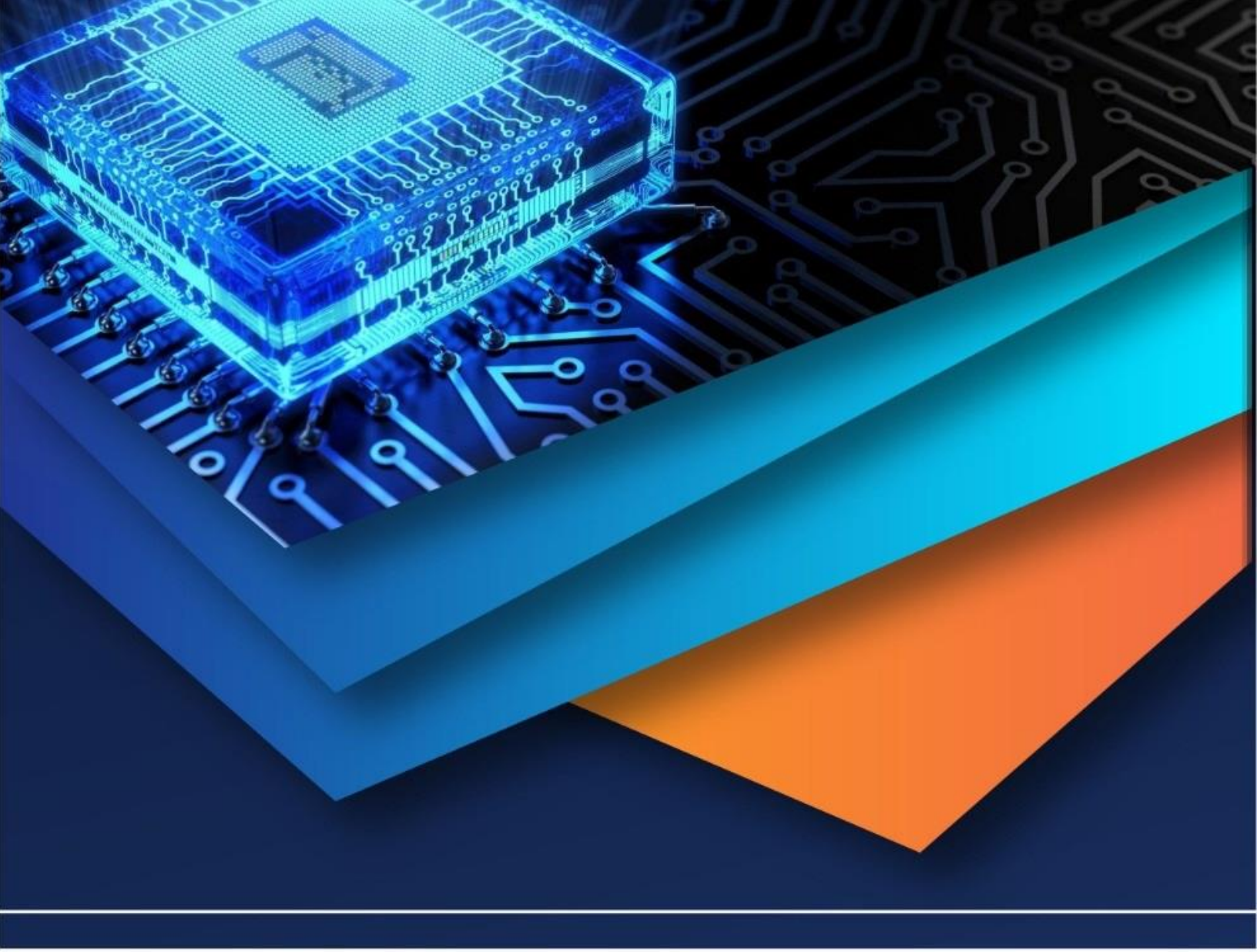

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