A Research Paper on New Generation Gym Mat

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ABSTRACT- Gym has been more popular in recent years since it aids in the maintenance of one's health, increases flexibility, improves concentration, and motivates individuals to live a healthy and tranquil life. People used to practice Gym on any surface, but today they prefer to do it on a Gym mat since it offers greater comfort and ease. The primary purpose of a Gym mat is to prevent or minimize hand and foot slippage. The Gym mats that have been created so far are not automated and cannot be controlled using a speech system. The researcher suggested an automated mat that can be controlled via a speech system in this article. Temperature sensor, weight sensor, movement sensor, piezoresistive sensor, pressure sensor, vibrator, display screen, roller with direct current (DC) motor, voice system, AI camera, and AI-based controller are all included in this mat. This Gym mat is superior to the previous one since it is automated and can recommend workouts based on the user's age. The automated Gym mat has a promising future since it may be further customized by incorporating new technologies and mechanics.

KEYWORDS- Artificial Intelligence (AI) camera, Controller, Sensors, Voice System, Gym mat.

I. INTRODUCTION

The popular and extensively researched use of ubiquitous computing motivates individuals to exercise and to help them track their personal development. The bulk of systems created to date have been designed to monitor aerobic training, including running and cycling. The majority of these workouts involve speed, distance, and terrain that can be consistently tracked by a single discreet body motion sensor and a Smartphone Global Positioning System (GPS) receptor, for example. Much less effort in the fields of strength and physical endurance education, especially in terms of wide-spread disobtrusive methods. It is difficult to perform exercise on bare ground as there is a change of injury. So, Gym mat are used to perform asana & exercise.

In contemporary Gym activity, Gym mats are particularly produced to avoid slippage of hands and feet. A first ruler of rubber tapestry, developed in 1982 by Angela Farmer, was dubbed a sticky mat. A rubber tapestry underlay. Meditation Gym and hatha Gym were practiced on bare soil before modern times, occasionally with a deer or a tiger rug. Modern Gym Matts consist of hessian and cork, trading off cost, convenience, grip and weigh, and are suited for the intense shapes of the Gym. "One of the most omnipresent symbols of marketing Gym" Gym mat was dubbed [1]. The thickness of Gym Mats, the composition, the texture of the surface, 'stickiness' or grip, weight and price may differ. They usually are around 180 cm and are about 6 feet long and 2 feet wide (61 cm). For the highest performance mats or Gym-therapy-soft mats, the thickness ranges from lightweight 'tranches' at 1/216 inch (2 mm) to 1⁄8 inch (3 mm) (standard) and up to 1⁄4 inch (6 mm) (standard). In numerous colors and designs, mattresses are available [2]. Alignment mats are printed with guidelines that are suitably aligned to assist practitioners to distinguish their feet correctly and precisely. Others with pictures are printed. Some tags can be folded into a little square.

The first "sticky" Gym mat produced commercially has been constructed of Polyvinyl chloride (PVC); its surface is smooth and inexpensive. More recently, several allegedly "environmentally friendly" mats are manufactured of natural yute, organic cotton and rubber. The spongiest are the PVC mat, leading to greater "give" if walked on, and firmest are fibre-based mats like cotton or jute. The roughest of the jute mats are the "stuck" PVC mats, but also some of the contemporary textured mats are well suited for other materials. Smooth mats offer the most grips so that they may be used for the most intense forms, such hot Gym and Ashtanga vinyasa Gym; they might be less comfortable and dirtier faster [3]. Figure 1 shows the existing Gym mat for exercise.

Figure 1: The above diagram shows the existing Gym mat for exercise [4]

Researchers have made this automatic Gym mat. This mat consists of various sensors such as movement sensor, Temperature sensor, pressure sensor, weight sensor, Vibrator, Display screen, AI based controller, Voice system, AI camera and Roller with DC motor. These components are working together to make this mat automatic. This mat also able to monitor user's health. The working of all the components used in this mat is explained in methodology.

II. LITERATURE REVIEW

Mathias Sundholm et al. discussed about a Smart mat which can recognize and counts gym exercise [5]. There are a wide range of physical workouts per site, typically on specific "mats" (e.g. push-alone, cracks, bridge). These workouts entail co-ordinate movements of many body parts and with single carbohydrating sensors are difficult to detect (like a step counter). Rather, it would require a network of sensors on various body regions that is not always possible to achieve. Alternatively, we present a low cost, basic textile pressure sensor matrix that may be incorporated into training mats in order to identify and take such activities into account. In a series of 10 typical exercises we evaluate the system. We achieve an independent user identification rate of 82.5 percent in an experiment including 7 people, each repeating 20 times each exercise, and an independent user counting accuracy of 89.9 percent. This article explains the sensor system, the techniques of recognition and test results.

Lemermeyer et al. discussed about the Gym mat [6]. Even though Gym has been practised for thousands of years with no particular surface, the Gym mat currently appears to be a near-essential element of practise. It investigates the intimacies, closeness, and space of the Gym mat as it is used in the real world. Not only does Gym practise on the mat create a holy environment, but also the practise of Gym.

Alexis Hiniker et al. discussed about Ubicomp [7]. A broad range of technologies, methods, user situations, and institutions were represented at the 2014 ACM International Joint Conference on Pervasive and Ubiquitous Computing. Contributors pushed the limits of what's possible, from wearable computers in space to smart mats for gyms, and continued to expand the reach of technology to be ever-more widespread and omnipresent.

A. Research Question

- What are the different components used in this Smart Gym mat?

- How this smart Gym mat is better than the existing Gym mats?
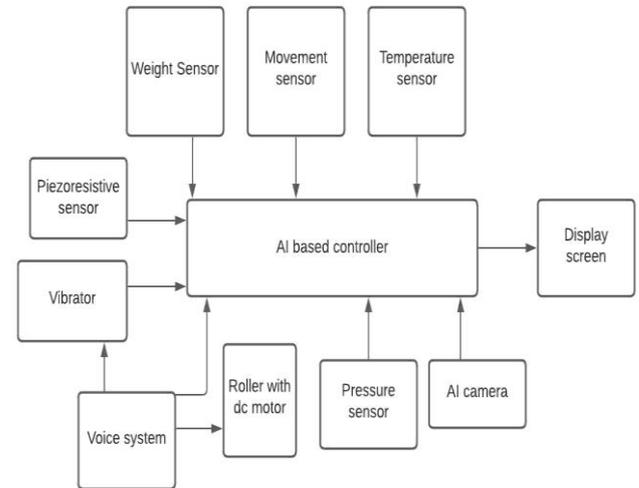
III. METHODOLOGY

Figure 2: Illustrates the block diagram of various components used in Automatic Gym mat

Figure 2 shows the block diagram of different components used in Automatic Gym mat. This Gym mat comprises of various sensors like weight sensor, movement sensor, temperature sensor, Piezoresistive sensor & pressure sensor, display screen, AI camera, Voice system, Vibrator, Controller based on AI, Roller with DC motor.

Figure 3 depicts the operation of the various components included in the Automatic Gym mat. This mat has a speech system that can be enabled through the user interface. When the speech system is turned on, and the user wishes to exercise on a gym mat, the user must say "Open the mat," and the mat will be rolled down onto the surface with the assistance of a roller. All of the sensors embedded in the mat are active. The weight sensor is utilized to help with balance and alignment. The temperature of the environment is measured using a temperature sensor. The user's movement is detected and measured using a movement sensor. The AI camera is used to verify that the user is correctly completing the workout. With the assistance of a Light emitting Diode (LED) put in the mat, green light is displayed if the postures are right, and red light is shown if the postures are incorrect.
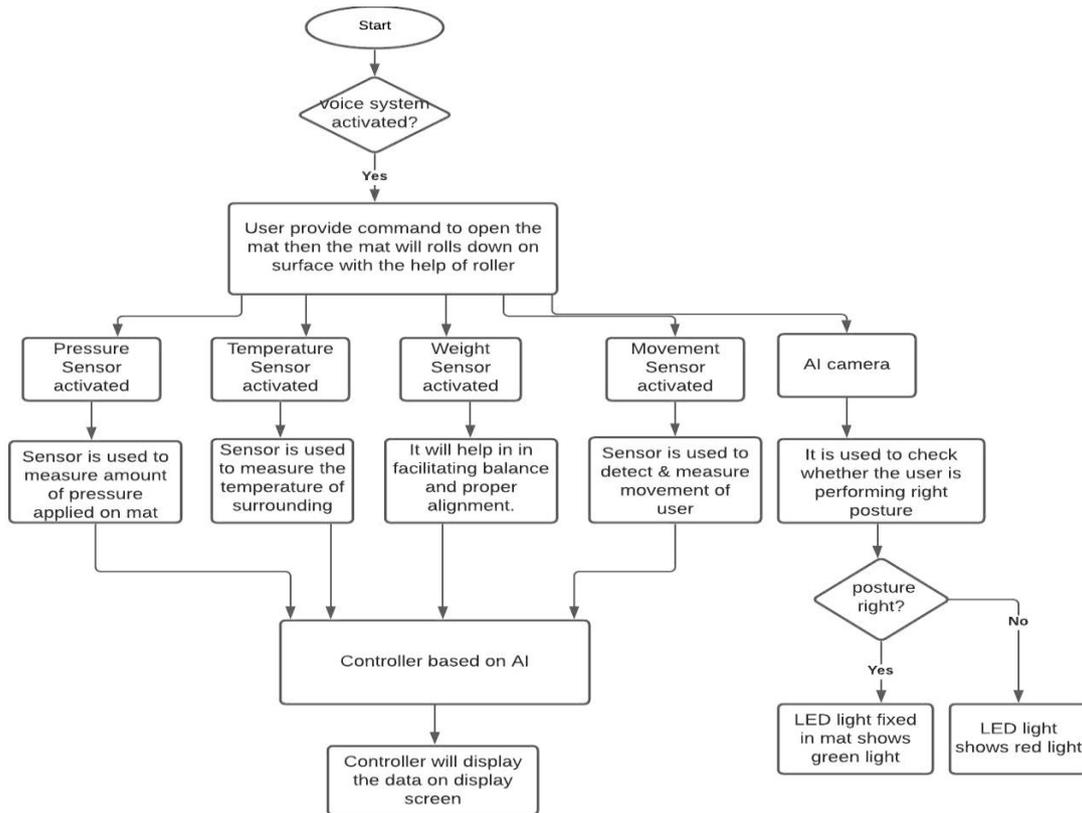
Figure 3: The above diagram shows the working of components involved in Automatic Gym mat

All sensor data is transmitted to the controller, which controls all operations and displays them on the display screen. This Gym mat also suggests exercises depending on the user's age. This mat is adjustable, which means it extends to fit the user's size and height.

B. Instruments

1) *AI camera:* AI cameras are just cameras which are able to handle pictures and movies using AI algorithms. It is used to check whether the user performing the asana/exercise correct in real- time configuration. It is placed in display screen and display screen is placed in Gym mat. The representation of AI camera is shown in Figure 4.

Figure 4: Illustrates the representation of AI camera used in this automatic Gym mat [8]

2) *Vibrator:* It is a device used for massage. In this mat, it is used to provide relaxation for user if the user feels tired.

3) *Temperature Sensor:* A temperature sensor is a device used to measure temperature. This can be air temperature, liquid temperature or the temperature of solid matter. The module of Temperature sensor is shown in Figure 5. In this device, it is used to measure the temperature of surroundings.
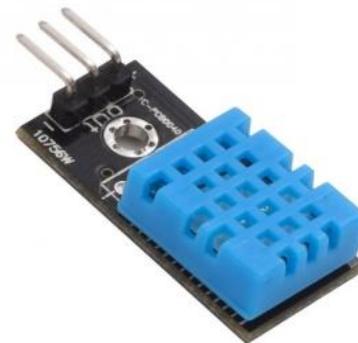

Figure 5: The above diagram shows the module of Temperature sensor [9]

4) *Pressure sensor:* A pressure sensor works by converting pressure into an analogue electrical signal. It is a sensor that is used to measure the pressure applied by the user on the mat. The data is sent to controller and further it is displayed on display screen. The module of pressure sensor is shown is Figure 6.

Figure 6: The above diagram shows the module of pressure sensor [10]

5) *Voice system:* It is a system which follows user commands like open the mat, play music etc. It is connected with whole mat so that the user can control the mat automatically.

6) *Movement Sensor:* It is a sensor that is used to detect and measure the movements of user. This sensor can also works with AI camera as AI camera can provide live movements of user to this sensor.

7) *Iris mechanism:* Iris is a novel mechanism integrated into the upper limb rehabilitation process. The centre can gradually open as any layer rotates, because to the particular structure or motion of the iris mechanism [11]. Different centre sizes can be developed according to the desired designer.

IV.   RESULTS & DISCUSSION

Gym mats, as previously stated, are manufactured mats designed to prevent hands and feet from becoming slippery during asana practice. Gym mats may be used as gym mats as well. In contrast to other gym mats on the market, which do not have a speech recognition system and must be folded manually, this Gym mat's folding and unfolding is controlled by the user's voice, and the user does not need to do any manual operations for unfolding and folding. It is the primary advantage this Gym mat has over other Gym mats. These mats are utilized because they offer a variety of advantages to users, including decreasing muscular tiredness and pain, increasing ligament and joint health, and improving general mental illness. Researchers created an automated Gym mat with different sensors such as temperature, weight, pressure, and movement sensors, as well as a roller with DC motor, vibrator, voice system, AI camera, display screen, and AI-based controller. To make this mat automated, all of the components operate together. This mat also suggests exercises based on the user's age. The iris mechanism allows this mat to be adjusted to the user's size and height. This mat has a promising future since it can save users time and can be further customized using new technologies and processes.

V.   CONCLUSION

A gym mat is useful for keeping hands and feet from sliding while doing any asana or workout. There are many advantages to utilizing a Gym mat, including the reduction of muscular tiredness and pain, as well as the improvement of general mental sickness. Many mats for practicing asana have been created, however they simply serve to keep the body balanced and avoid damage. Researchers created an automated gym mat that may also be used as a gym mat in this study article. This mat includes temperature, weight, pressure, and movement sensors, as well as a vibrator, a roller with a DC motor, an AI camera, an AI-based controller, a display screen, and a voice system. They're all working together to automate the Gym mat. This mat responds to human inputs and does tasks such as playing music. This mat can be adjusted, it can suggest exercises based on the user's age, it can live monitor the user's postures with the aid of an AI camera, and it can do a lot more. This automated Gym mat outperforms the competition. Gym mats have a promising future since they may be further customized by incorporating new mechanisms and technology.

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