Pre-Emptive Smart Fan System to Avoid Suicide by Hanging

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Abstract: *According to the most recent study from the World Health Organization, India has the highest suicide rate in the South-EastAsian area. India's suicide rate was estimated at 10.4 suicides per 100,000 persons in the study released the day before World Suicide Prevention Day in 2019. Because of the depression people experience, the suicide rate has soared since the corona virus epidemic began. Suicide is most frequently committed by hanging oneself from a fan. The global rate of hanging suicide is quite concerning. According to a report by the Indian government's National Crime Records Bureau (NCRB), quite a few hanging instances are documented each year. The majority of hanging cases are typically suicidal. The likelihood of a homicidal case leading to a hanging scene is exceedingly high. The crime scene must be examined on several key points in an undisturbed state, followed by an autopsy analysis, in order to differentiate between suicidal and homicidal hangings. Many other systems have been suggested to stop these cases. Thus, the primary goal of this study is to decrease the number of suicide attempts that occur, and these prevention techniques will aid in saving lives in order to address this issue.*

Keywords: Suicide, Hanging, Ceiling Fan, Micro-controller, Sensor, IOT

I. INTRODUCTION

In Australia, suicide is the third-leading cause of death after cancer and heart disease, accounting for about 2,500 fatalities annually. The primary cause of mortality for Australians between the ages of 15 and 44 is noteworthy. Suicide is the result of a complex interplay of psychological, social, andhealth circumstances rather than having a single causation pathway. Therefore, preventing suicide is difficult and necessitates a systems-based approach that includes public health policies, screening at-risk persons, targeted interventions, and follow-up with survivors of suicide and those who have lost loved ones to suicide. In several cases, it has been claimed that engineering practices have hamperedthe spread of suicide prevention.

Suicide prevention encompasses a variety of activities aimed at lowering the risk of suicide. Individual, relational, community, and societal initiatives may all be involved. Often,suicide may be avoided. Around 800,000 individuals pass on byself-destruction overall consistently. 139,123 Indians ended it all in 2019 and the public self-destruction rate was 10.4 (determined per lakh of populace). As per The World Health Organization, in India, self-destruction is an arising and genuine general medical problem. India's self-destruction rate per 100,000 individuals contrasted with different nations, as perthe World Health Organization, Geneva. Peeter Värnik claims China, Russia, United States, Japan, and South Korea are the greatest supporters of unquestionably the quantity of suicides on the planet. Värnik claims India's changed yearly self- destruction rate is 10.5 per 100,000, while the self-destruction rate for the world overall is 11.6 per 100,000.

India's commitment to worldwide self-destruction passingsexpanded from 25.3% in 1990 to 36.6% in 2016 among ladies, and from 18.7% to 24.3% among men. In 2016, self- destruction was the most well-known reason for death in both the age gatherings of 15-29 years and 15-39 years. Somewhere in the range of 1987 and 2007, the self- destruction rate expanded from 7.9 to 10.3 per 100,000, with higher self-destruction rates in southern and eastern territories of India.

Suicide prevention techniques concentrate on lowering risk variables and intervening strategically tolower the risk level. A skilled mental health practitioner can analyze risk and protective variables that are specific to the individual There are many methods to Evert a personfrom committing suicide.

II. RELATED WORKS

S. Sankaranarayanan et. al. [1] proposed a system for preventing suicide on ceiling fan. The proposed project system includes a PIC 16f877a microcontroller, a PIR sensor, a flex sensor, a GSM module, a buzzer, and an actuator. MPLABIDE have been used for the programmingpurpose and proteus simulation software is used for the simulation purpose. The PIR sensor detects the presence of a human, the flex sensor detects the presence of additional weight on the ceiling fan, the GSM module is used to send the message to the registered mobile number, and the motor or actuator which is linked to the ceiling fan to safeguard the hanging.

Abinash Mishra et. al. [2] have proposed a new safety design of a ceiling fan to avoid suicide Attempts. Prior to designing a new model, they performed a stress analysis on all of the existing general model fans to determine the force the fan's weight exerted on the down rod. The down rod is replaced in the new design by a spring that is attached to a home's ceiling fan. For a spring to be connected to a fan, they have designed aspring connector which is mechanically connected to the disc of a fan. The design of a spring is done in such a way that, it should carry a minimum weight so that when someone tries to hang themself to a fan then the spring will elongate and come down making a person's feet touch the ground.

Raghavendra S Narsapur et. al. [3] have proposed a system consisting of a ceiling fan with hardware components of RENESAS microcontroller, PIR and Force sensor, Buzzer,GSM module, switch and DC motor. And software used are Cube suite+ and RENESAS flash programmer. The microcontroller located at the center of the block diagram forms the control unit of the entire project. They have used dc motor to control the movement of a fan and to control the motor they have used l293D motor driver. Whenever the person tries to hang the force sensor senses the set weight, if it's more than theset point weight, the beam gets elongated and comes down, andalarm is activated and GSM module will send an alert messageto the respective guardian

Prabha Sundaravadive et. al. [4] have proposed an IoT- based Edge intelligent Framework for Suicidal Ideation Detection. This system has concentrated on creating an IoT-based framework that can assist in continually monitoring a person's behavioural and physiological data. The suggested M-SID framework encourages the development of a special suicidal ideation elicitation technique for its users. The first goal wasto cheer up the user and divert them from making a decisionto harm themselves. The computer work is concentrated on tracking a person's overall movement, heart rate, and environment. The custom wearable is created with the aid of "generic" commercially available sensors that have been tailored to the required parameters in order to validate the hypothesis. The M-SID wearable uses a temperature and humidity sensor to track the user's environment over a specified time. The device will display the results as "vulnerable event," "critical event," and "normal event" inaccordance after receiving these all parameters from the pulse oximeter, a medical-grade sensor that assists in daily heart rate collection.

Wassim Bouachir et. al. [5] posited an intelligent video surveillance system for automated detection of suicide attempts by hanging. By utilising the depth data obtained from an RGB-D camera, this proposed system is capable of simulating suicidal behaviour well. The use of RGB-D cameras opened up a new avenue for solving pose estimation problems in real time. They provide innovative solutions for dealing with the identification of activities based on eyesight. This approach is based on making use of the 3D visual data captured by an affordable RGB-D camera. This specifically involves using human joint relative positions in the 3d space to calculate position and motion attributes during movement in order to grasp the activity of interest. Each ongoing observation isprocessed by their recognition system, which then does a binary ranking to identify any suicidal behaviour. If the percentage of positive observations exceeds a specific threshold over the course of a sliding brief window, the activity of interest is eventually discovered.

S. Berrouiguet et. al. [6] have proposed a mobile e-health application to help prevent suicides. The mobile app allowed the registered outpatients to give feedback regularly about theirhealth status. The recruitment of the patients to be performed through the WORECA consortium and sites of recruitment includes leading research groups in suicide prevention, data mining and neuroscience. This application helps clinicians to assess their patients' status, send recommendations to an expertevaluation.

Mark E. Larsen et. al. [7] have put forward an outline of theon-going technological developments which are enabling research in the field of fending off suicides, which includes numerous modes of screening such as network inspection of handheld phones gathered connectivity data, automatic identification of suicidality from social media content and cataclysm identification from acoustic variability in speechstyle. mHealth apps for suicide prevention is evaluated and

an innovative application for suicide prevention is evaluated. Prevention of suicide can prove to be a hectic task that necessitates a system approach in involving public health schemes, scanning those individuals who are at a risk, selective choosing in intercession and a follow up for suicide over-comerand those who have are deprived because of suicide. It has been noted that engineering practices has hampered the adoption of suicide prevention. Participants installed the application ontheir own handset, either android or iOS. The application that was installed did a periodic Bluetooth finding scan to identify other nearby users, and was tested in an experimental trial withstaff and students inside the organization. based on the data scanned, connectivity between the individual participants in close proximity can be observed. A collective mapping can then be defined by putting together the screened data of the individuals. The mass of the network edges was obtained fromnumber of times each pair of devices observed each other hencemapping a network topology in spite of the fact that there is a scarcity of evidence based immersive apps currently available to the public, the situation is changing which brings us to talk about the app called ibobbly.

Pratool Bharti et. al. [8] have proposed a watchdog system with applications in psychiatric facilities to detect self-harmingactivities attempts by in-patients. Three components form the proposed system. Handheld Accelerometers: This system collects and processes data using little accelerometer sensors incorporated in wristband attachments. an effective algorithm to determine if a user is active or dormant (that is, engaged in physical activity or inactive); and a novel decision selection algorithm based on random forests (RF) to decide on the activity by independently processing the accelerometer readings in each wrist and then they have come up with the conclusion that has a combination of two results from either wrist to have a one complete output, based on the notion of continuity indices. A clinical psychiatrist supervised an experiment that they also carried out with 11 participants.Each subject was given instructions to perform a variety of tasks, from walking and running to dangerous activities like hanging. Using the suggested techniques, the subjects' overall classification accuracy was 98 percent for same-user 10-fold cross-validation, 94 percent for cross-user 10-fold cross-validation, and 70 percent for cross-user leave-one-out evaluation. The system is practical since it requires very little energy and has very little delay during choice selection.

Oussema Keskes et. al [9] proposed a general vision-based system, using Spatial Temporal Graph Convolutional Networks(ST-GCN). The system has demonstrated its reliability and effectiveness in the field of action recognition. In contrast to other research, this model offers outstanding accuracy andmay be used immediately on new data without the requirementfor model training. In addition to its other benefits, transfer learning allows us to address the issue of data scarcity. They were able to obtain 100% accuracy by validating their method using these three datasets: the NTU RGB-D data set, the TST Fall detection data set v2, and the Fall free data set.

Kasturi dewi varathan et. al. [10] have proposed a system thatcan identify any words related to suicide on twitter. Additionally, this method was utilised to quickly detect suicide by listening to tweets that one received. This approach can be used by NGOs and psychologists to monitor suicidal people who have a history of attempted suicide. As a result of social media becoming one of the most commonly used platforms for communication, we can now discuss twitter, which has approximately 206 million active users globally andan average of 58 million tweets per day. According to a frightening data from a semi-annual survey on youth risk behaviour in the United States, adolescents account for the largest percentage of the overall suicide rate, with one in everytwelve teenagers having tried suicide. As seen by the countlessinstances in which kids have posted comments on social mediaplatforms discussing suicide, these teenagers prefer to express their emotions online rather than in person. Unfortunately, thisisn't taken seriously and is frequently ignored, which eventually results in their death. Therefore, we should make use of these platforms to stop these kinds of deaths. The suggested system, also known as TEDAS or Twitter-based Event Detection and Analysis System, is used to identify and evaluate occurrences by sifting through a wealth of data on thesite. The suggested system performs three tasks: it detects newevents, ranks them in order of importance, and generates temporal and geographical patterns of the events. Additionally, this method can be used to discover new Twitter features that rank tweets and their locations according to a set of cleanly defined phrases and that are used to highlight crime and disaster-related events (CDE).

III. PROPOSED WORK

The objective of this project work is to efficiently prevent suicide attempt. We have developed a smart fan that meets the following objectives:

1. To design a system which can detect a person'ssuicide attempt.

2. To design a Sensor Module to monitor the fan.
3. To Intimate a System when suicide attempt happens.
4. To Develop the Suicide Avoidance Module throughSpray.

3.1 Methodology

The task has the essential thought of discovery and assortment. The sensor will automatically detect the weight of the person with the help of the camera. The detected weight is given as theinput to raspberry pi module which will in turn, turn on the DCMotor Connected to Pulley, then the fan is automatically released down.
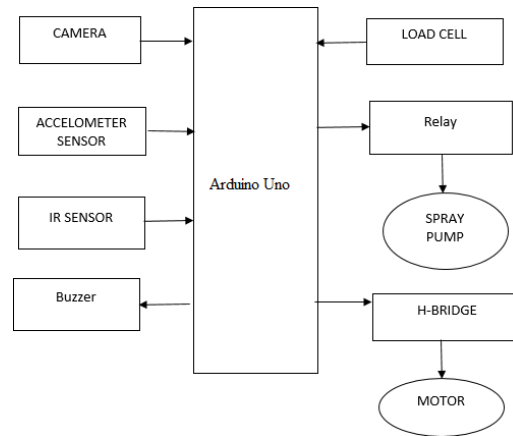

Fig 1. Block diagram of the system

Whenever someone tries to hang themselves to a ceiling fan,

- Load cell is used to detect the hanging weight, if weightincreases beyond the threshold value, immediately the input is given to raspberry pi module which will in turnon the DC Motor Connected to Pulley, then the fan is automatically released down
- When Suicide attempt happens, the camera turns on andit Captures the person's face and is given to the raspberry pi module which will send the captured images and an alert message to the concerned person through GSM module and buzzer will start beeping to alert the surrounding people.

At the same time the raspberry pi module will give an input to the relay to which a spray pump is connected tospray the chloroform on person who is trying to commitsuicide.
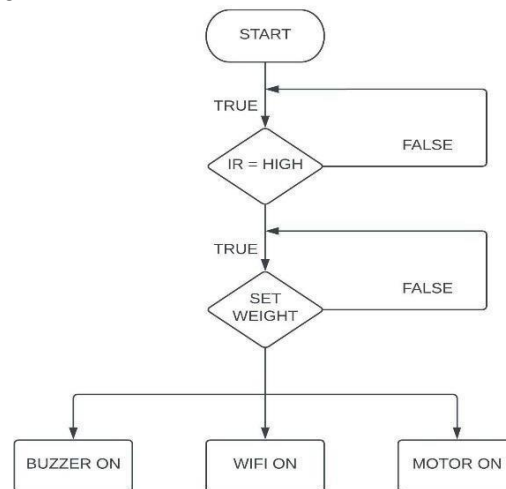

Fig 2. Flowchart

In this proposed system if the IR sensor is detected next it will look for the change in weight if there is change in set weight the buzzer, Wi-Fi module and motor or actuator willwork if not it will go back to the initial condition.

IV. TEST AND RESULTS

Each suicide is a unique tragedy that takes a person's life too soon and has an ongoing ripple effect that affects families, friends, and communities. In our nation, more than 100,000 people take their own lives each year. Suicides can be caused by a variety of things, including issues with one's job or career, loneliness, abuse, violence, problems with one'sfamily, mental illness, alcoholism, financial loss, chronic pain,etc. Police-recorded suicide cases are a source of information for NCRB on suicides. A total of 1,53,052 suicides were reported in the nation during 2020, a rise of 10.0 percent from 2019 and an 8.7 percent increase in suicide rate from 2020 to 2019. Table shows the frequency and rate of suicides from 2010 to 2020.

Fig 3. Photograph of a Case where lcd display is showing the hanging scenario

Fig 4. Photograph showing mechanism preventing person fromhanging.

Sl. No.	Year	Total Number of Suicides	Mid-Year Populaton* (in Lakh[+])	Rate of Suicides (C3/C4)
(1)	(2)	(3)	(4)	(5)
1	2016	1,31,008	12,739.9	10.3
2	2017	1,29,887	13091.6	9.9
3	2018	1,34,516	13233.8	10.2
4	2019	1,39,123	13376.1	10.4
5	2020	1,53,052	13533.9	11.3

V. CONCLUSION

Self-destruction is the act of purposefully committing suicide. A youngster or anyone who is fighting misery or passing away from overwhelming horror of disappointment is devastating to loved ones, and the possibility of self- destruction is more notable in homes where a child is left alone because he or she may have trouble focusing or thinking clearly will engage in risk-taking behaviours. People choose to hang themselves from roof fans morefrequently than not since it takes some effort for death to occur, and some of them merely consider trying to kill themselves. We'll wrap up by reviewing all of the theories put forth for how we might completely avoid self- destruction attempts with the aid of emerging

technologies. Each and every framework presented here is designed to provide parents and guardians with security. The System is capable of producing the needed results and will be created using structured modelling. With a few adjustments, it will be successfully implemented as a Real Time system. Technology is constantly evolving as a result of key scientific discoveries and inventions in numerous domains. Further, the majority of the units can be produced on a single, together with a microprocessor, making the system compact and increasing the effectiveness of the current system. To make the system applicable for real time purposes components with greater range needs to be implemented.

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