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Smart Broom

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Abstract: - This paper aims for designing and executing the advanced development in IOT based systems for real time monitoring on sweeper of smart city. Cleanliness - Everyone's prior concern, Authors have taken initiatives to keep our city clean. Even large no. of sweepers are employed for cleaning purpose but the problem arises when they do not work properly. So, here comes in role our SMART BROOM which will Inform working Hour of sweeper , Location of the sweeper, Monitor Regular Working of Sweeper ,Data analysis of the work done ,Assure the cleanliness of streets ,Keeping an eye on Doodle worker .

Keywords: - Microcontroller, GPS, Accelerometer, Vibration Sensor.

I. INTRODUCTION

The cleanness is the major problem of the city. Ansmart broom will played major roll in cleaning of cities. The smart broom provide the information about effective working hours of sweepers with , rating of cleaning , real time location of the sweeper. For that purpose we mount one embedded system on the broom. That embedded system contains vibration sensor, accelerometer, NodeMcu ESP8266 work as a data logger. The motion of the broom is measured with the help of vibration sensor and accelerometer. The location of the sweeper is find out the with help of GPS coordinate of the sweeper mobile.

II. PROBLEM STATEMENT

Product is mainly designed keeping in mind the needs of the Municipal Corporation of Cities. The workers mark their attendance and carry their broom sticks but do not reach the desired location or even if they go, they do not work properly and places, even after all the expenses remain to be untidy and ultimately become home for diseases. The product can also be of great use for the residential purpose and MNC's to monitor their cleaning staff for proper cleaning of the premises.

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Objective:

- Inform working Hour of sweeper
- Location of the sweeper
- Monitor Regular Working of Sweeper
- Data analysis of the work done
- Assure the cleanliness of streets
- Keeping an eye on Doodle worker

III. METHODOLGY

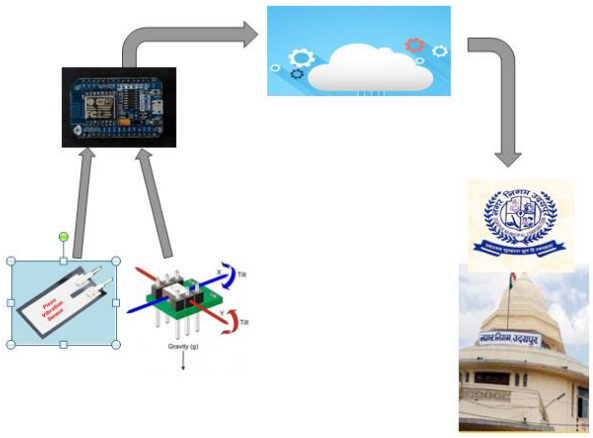

Fig. 1: Flow Chart

Node-MCU ESP8266:Node-MCU is work as controller. It contains analog and digital input–output pins.It also containESP8266 wifi chip. Wifi chip is used for push the data on the cloud. With the help of Node-MCU we read the data from the accelerometer and vibration sensor. According to the values from the sensors we decide the broom in motion or in rest and touch to the ground surface or not.

Vibration Sensor: Vibration sensor worked on the principle of piezoelectric effect. In vibration sensor developed using crystal and seismic mass. Vibration sensor placed at the bottom of broom, when broom will used in cleaning stage at that time crystal is deformed and develop electric potential.Potential is directly proportional to speed of motion of broom.

Accelerometer: The broom acceleration is measured by the accelerometer sensors capacitance. It's contained heavy springmovable in single direction and has fixed outer plates. It attached to the handle of broom, When broom in rest there is no change in the capacitance of accelerometer but broom will be used by sweeper then capacitance of accelerometer will be change .

GPS Location: To find out the GPS location in term of latitude and longitude we used Wi-Fi network.

It works on the pre-recorded data online at the time of GPS tracks the location of any object, it also search the strong Wi-Fi networks near it.

In future sweeper will come in this Wi-Fi network his GPS will location also identified with the help of pre-recorded data.

Cloud: After collection of the data from accelerometer, vibration sensor and GPS location we push the data on the thing speak cloud with the help of ESP8266 Wi-Fi Module on Node-MCU.

When sweeper is start working firstly switch on the device on the broom. This time is recorded as start time of cleaning. The data from the accelerometer and vibration sensor will collected by Node-MCU and push to the Thing speak cloud. The existing Wi-Fi network provide GPS location coordinates in term of latitude and longitude parameters. That parameters also push to the thing speak cloud. Authors also note down the switching off time of device. On the basis off switch on time and switch off time authors also find out the total working duration.On the basis of the parameters from the vibration and accelerometer we working duration divided in the three category not cleaning time, medium cleaning time and good cleaning time. On the basis of GPS coordinate we also conclude how much area cleaned by sweeper. All the information will share to the administration of the city.

IV. RESULT

Table 1: Data from Smart Broom on 2-3-2019

created_ at	Accelerometer	Vibration	Longitude	Latitude
2019-03-02 13:21:26 IST	29	0	24.51792	73.75176
2019-03-02 13:21:43 IST	27	4	24.51792	73.75176
2019-03-02 13:22:00 IST	28	12	24.51792	73.75176
2019-03-02 13:22:16 IST	29	7	24.51792	73.75176
2019-03-02 13:22:31 IST	25	7	24.51792	73.75176
2019-03-02 13:22:48 IST	21	9	24.51792	73.75176
2019-03-02 13:23:05 IST	25	8	24.51792	73.75176
2019-03-02 13:23:20 IST	28	2	24.51792	73.75176
2019-03-02 13:23:37 IST	27	2	24.51792	73.75176
2019-03-02 13:23:53 IST	27	2	24.51792	73.75176
2019-03-02 13:24:10 IST	28	1	24.51792	73.75176
2019-03-02 13:24:26 IST	29	1	24.51792	73.75176
2019-03-02 13:26:29 IST	19	2	24.51792	73.75176
2019-03-02 13:26:46 IST	25	2	24.51792	73.75176
2019-03-02 13:27:01 IST	25	2	24.51792	73.75176
2019-03-02 13:27:16 IST	31	15	24.51792	73.75176
2019-03-02 13:27:33 IST	27	1	24.51792	73.75176
2019-03-02 13:27:51 IST	31	7	24.51792	73.75176

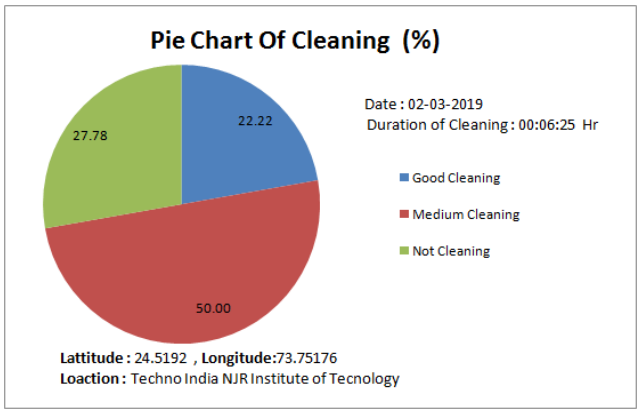

Fig. 2: Pie Chart 1For Data from Smart Broom on 2-3-2019

Table 2: Data from Smart Broom on 2-3-2019

created_ at	Accelerometer	Vibration	Longitude	Latitude
2019-03-02 15:10:50 IST	26	3	24.51792	73.75176
2019-03-02 15:11:07 IST	28	2	24.51792	73.75176
2019-03-02 15:11:22 IST	29	2	24.51792	73.75176
2019-03-02 15:11:37 IST	30	2	24.51792	73.75176
2019-03-02 15:11:55 IST	28	2	24.51792	73.75176
2019-03-02 15:12:12 IST	29	2	24.51792	73.75176
2019-03-02 15:12:29 IST	29	2	24.51792	73.75176
2019-03-02 15:12:45 IST	29	2	24.51792	73.75176
2019-03-02 15:13:02 IST	29	2	24.51792	73.75176
2019-03-02 15:30:15 IST	29	2	24.51792	73.75176
2019-03-02 15:30:31 IST	27	2	24.51792	73.75176
2019-03-02 15:30:49 IST	22	5	24.51792	73.75176
2019-03-02 15:31:06 IST	12	7	24.51792	73.75176
2019-03-02 15:31:23 IST	26	4	24.51792	73.75176
2019-03-02 15:31:40 IST	28	2	24.51792	73.75176

2019-03-02 15:31:58 IST	28	1	24.51792	73.75176
2019-03-02 15:41:52 IST	22	4	24.51792	73.75176
2019-03-02 15:54:55 IST	23	2	24.51792	73.75176

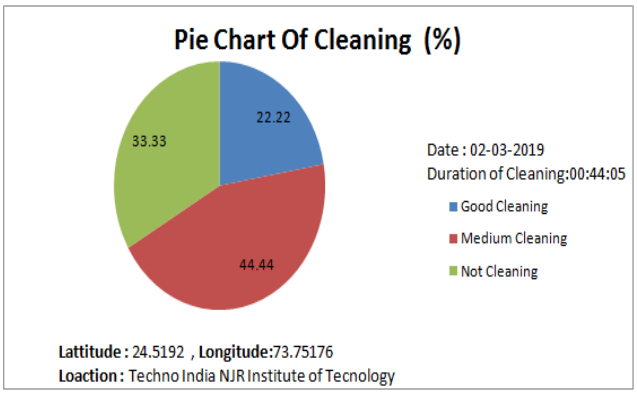

Fig. 3: Pie Chart 2 for Data from Smart Broom on 2-3-2019

Table 3: Data from Smart Broom on 5-3-2019

Created at	Accelerometer	Vibration	Longitude	Latitude
2019-03-05 15:01:56 IST	19	2	24.51792	73.75176
2019-03-05 15:02:12 IST	18	2	24.51792	73.75176
2019-03-05 15:02:28 IST	19	3	24.51792	73.75176
2019-03-05 15:02:46 IST	20	2	24.51792	73.75176
2019-03-05 15:03:02 IST	20	2	24.51792	73.75176
2019-03-05 15:03:19 IST	18	2	24.51792	73.75176
2019-03-05 15:03:35 IST	20	2	24.51792	73.75176
2019-03-05 15:03:51 IST	17	2	24.51792	73.75176
2019-03-05 15:04:07 IST	20	7	24.51792	73.75176
2019-03-05 15:04:42 IST	17	9	24.51792	73.75176

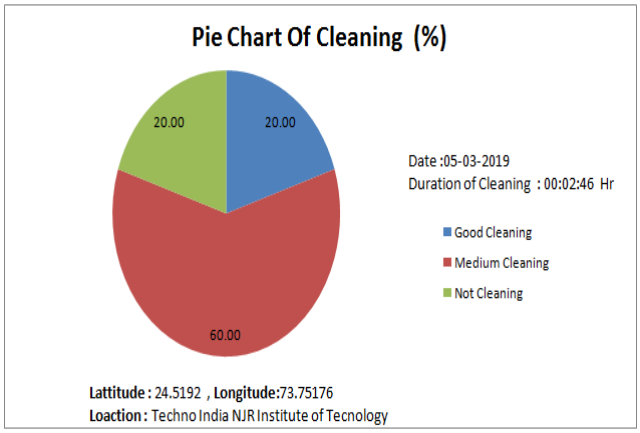

Fig. 4: Pie Chart 3 for Data from Smart Broom on 5-3-2019

Table 4: Data from Smart Broom on 8-3-2019

Created at	Accelerometer	Vibration	Longitude	Latitude
2019-03-08 15:09:22 IST	28	1	24.51792	73.75176
2019-03-08 15:10:49 IST	-74	2	24.51792	73.75176
2019-03-08 15:11:35 IST	31	8	24.51792	73.75176
2019-03-08 15:11:50 IST	24	15	24.51792	73.75176
2019-03-08 15:12:06 IST	26	0	24.51792	73.75176
2019-03-08 15:12:21 IST	27	2	24.51792	73.75176

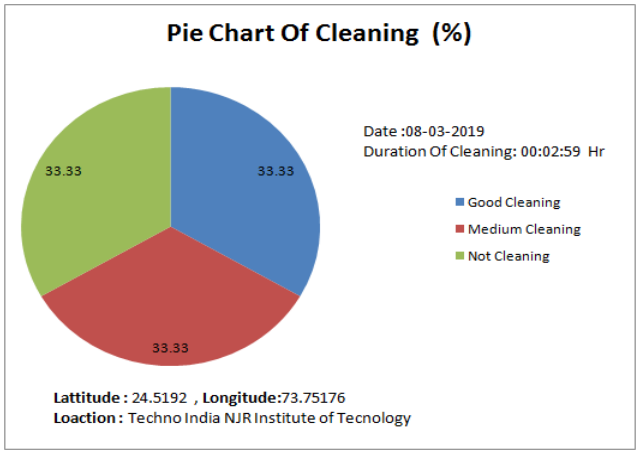

Fig. 5: Pie Chart 4 for Data from Smart Broom on 8-3-2019

IV. CONCLUSION& FUTURE WORK

Proposed system is based on the emerging technologies like IOT and cloud for real-time monitoring on worker. The classification of cleaning based on vibration sensor and accelerometer reading. If vibration sensor reading is less than 2 and difference of two consecutive reading of accelerometer is zero than cleaning count in not cleaning category,If vibration sensor reading is lies between 2 to 5 and difference of two consecutive reading of accelerometer is lies between 1 to 2 than cleaning count in medium cleaning category,If vibration sensor reading is more than 5 and difference of two consecutive reading of accelerometer is more than 3, than cleaning count in medium cleaning category.

Further, the developed work can be extended to apply the machine learning and data analytics on the collected data set to predict the how much area clean by sweeper,create comparison report of sweepers of the system.

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Dr. Vivek Jain has received Ph.D. (Engg.) from MPUAT University 2017. He is working as assistant professor in Techno India NJR Institute of Technology. He has 9 publication. He has supervised one M.Tech. candidates successfully. His field of interest is DSP, IOT and VLSI.

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