Auto-feed: Smart Pet Feeding System using Wireless Communication via MQTT Protocol.

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Abstract

In today's world, dogs and cats are treated as their family members. Whenever owners
are out for their work or vacation they are unable to keep a look at their pets. Traditionally, pets need someone to relay on for feeding them. So concluding this situation this model having the combination of Raspberry pi and NodeMCU will have capability to deliver food along with time schedule and IP camera for observing the pet . The outcome of this model is automatic Pet Feeder which receives instructions from the MQTT network and perform the task at the given date and time. And controls the motors via GPIO signals.

Keyword: *Raspberry pi, MQTT. NodeMCU, IP camera, GPIO.*

I. INTRODUCTION

Nowadays pets have become integral part of families. Sometimes due to some reasons pets are left alone in home. Owners sometimes fail to remember to give food to their pets because of their work. Pets are left home alone hence they might feel lonely, tiresome and also separation anxiety. As a result pet may misbehave and can urinate, scratch furniture and might hurt himself, these activities are performed to seek the attention of the owner. The disciplined feeding is one of the issues in pets that the pets have to be well maintained. To overcome this situation owners might use CCTV camera, to observe the situation of their pets but as a result camera can't satisfy the need of pets. As the pets that may play and roam around the house the visuals obtained by owners are in fixed shooting angle henceforth, this proposed plan will help in designing a toy car which will be equipped with feeding stuffs and water with remote control system. To attain the level of the purpose of feeding and water supplement this system will be controlling the movement through MQTT protocol through a smartphone/ website. However sometimes this might be the case where food is delivered on time but there is no acknowledgment weather the dog has successfully consumed his food or not. So in this

model IP camera is used to monitor the activities of pet and is able to send real time images to the owner on their smart pet application.

II. RELATED WORK

Paper Concept:

[1]In this paper, the researchers studied about the Wireless Sensor Networks (WSN) that has been capturing increasing demand both from commercial and technical aspects. The paper gives detailed information about the lightweight protocol "MQTT" that is customized especially for operation on low cost and low power devices running over bandwidth restrictions. In this we study about point-to-point data transfer service. MQTT and its advantages as well as its key characteristics are explained in the paper.

Paper Concept:

[2]In this paper, researches design a module for feeding the pets; the module has stock information, feed schedule, waiting time and owner's name from server uses MQTT protocol. The module performs the feeding process with "RFID" (Radio Frequency Identification). The smart module is addressed to feed small to medium size dog. It has an security and identification system using RFID and is connected to a system called the working Hub which is encrypted with SSL/TLS.

Paper Concept:

[3]In This Paper, the researchers enhanced the working of the module. Now the owner can control the module to deliver food towards their pet in a remote mode through smart mobile devices. Some feeding modules also have a camera function that allows the pet owner to watch the pet at home through the camera. The pet feeder also allows setting time of the food delivery.

Paper Concept:

[4]In this paper, the researchers studied this system aims at providing a pet feeder with a camera, pedal, and internet connection. The machine will make our lives more convenient and make sharing and reminiscing easier. The Raspberry Pi controls a servomotor, pedal, camera, and Internet connection. Typically, a servomotor can turn 180 degree. However, we need continuous turning. So, we used 360 degree turn servomotor to open four trays. The pedal sends a signal to the control board immediately

III. GAP ANALYSIS

As of now, there is less pet feeder available India. This is resulting in many owners leaving their pets alone at home and not able to feed them. And make them anxious and left alone.
The use of smart pet feeder technology can be helpful to avoid such situations and solve pet owners problem. While using these pet feeding technologies we have considered the limitations of such technologies in various aspects like cost, durability, accuracy, etc.

IV. PROPOSED WORK
A. MQTT PROTOCOL

Previously HTTP was used as its transferring/transporting mechanism between the devices and IOT connectors. HTTP uses request/response mechanism where each device connects directly to IOT connector. MQTT is based on client and server where server is responsible for handing the requests of the clients as well as sending data between each other. It has to be supported with an addition
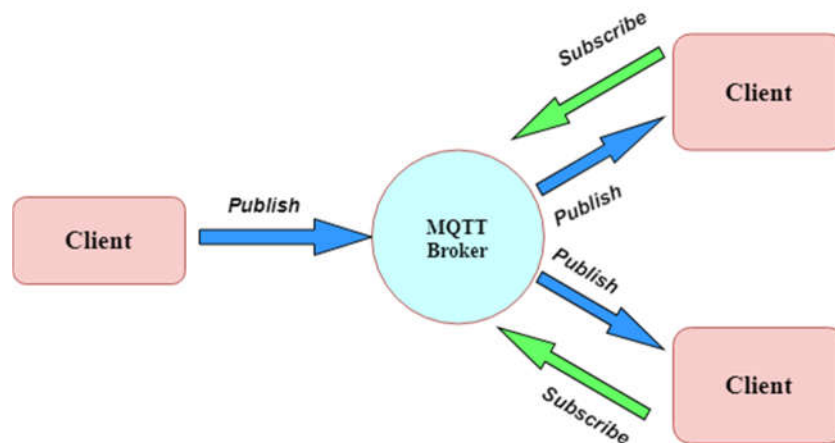
The module needs a central transmission point known as Broker which is in charge of transferring all the messages between transmitter and rightful receivers. Each client that publishes a message to Broker, includes a topic in a message the topic is routing information for the Broker. Each client that wants to receive messages subscribes to certain topic and Broker delivers all the message with the matching topic to the client. This structure enables highly compatible solutions without any dependencies between the data producers and data consumers.

B. SERVO MOTOR

To rotate or push an object with great definiteness at some specific angle or distance, servo motor is used. With an ability of high torque, small and light full packages servo motor are useful in many applications such as toy car. To control the motion and final position of shaft positive feedback system is used by generating and comparing output signal and reference control signal.

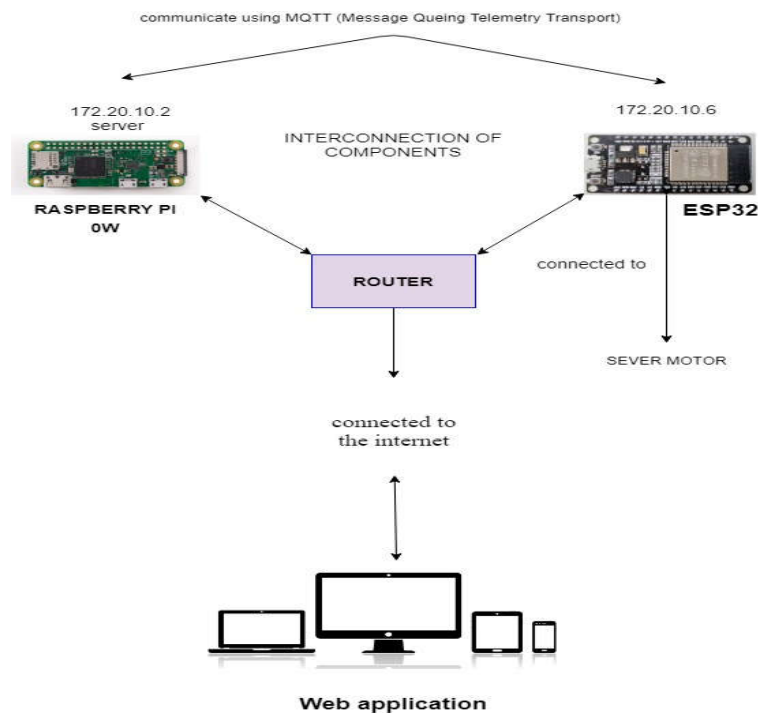### B.1. SYSTEM ARCHUTECTURE

Fig 1: System Architecture

The above fig 1 represents the proposed architecture of remote control pet feeding module. Through our app owners can give instructions/message to MQTT server using, android mobile phone. In IOT, Pushing and Polling protocols are widely used to communicate from device to device. Due to high productivity and low weight, push protocol is more suitable for IOT devices. In 1999 IBM released standardized publish/subscribe push protocol termed as MQTT. To deliver the data under network latency and low bandwidth conditions MQTT protocol was proposed. In the project plan there is the implementation of open source software, eclipse Mosquitto is installed on microcomputer that is Raspberry pi acting as a MQTT server. As the MQTT server receives the message it loads and analyse the instructions and uses I/O pins of Node MCU to control the motors.
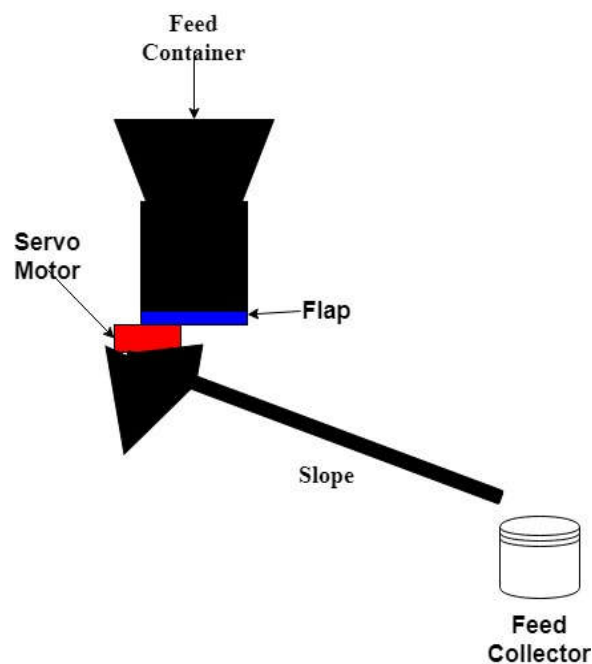

Fig 2: Expected design of the feed module

In this proposed architecture the feeding module can administer two DC motors, a servo motor which will act as a switch for the feed container. Hence whenever the owner presses the feed button on his android smartphone the servo motor will rotate a flap, and hence the food falls along the slope into his feed collector. An external power will be required to keep the motors in working conditions. ESP32 is communicating with raspberry pi i.e. server using publish/subscribe protocol (MQTT). Here

raspberry pi plays the role of publisher and publishes particular topic which is then subscribed by ESP32.

V. CONCLUSION

In this paper we make an attempt to present a smart feeding system equipped with microcontroller and IP camera. The combination of microcomputer(Raspberry pi) and microcontroller(ESP32) uses the MQTT server to transmit messages model and the end user. Microcontroller transmits the signals through pins to control the motor hardware. The module clicks a picture of pet after food is delivered and that picture will be sent to user.

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