Meow Meow
Smart Pet Interaction System

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Section 1 - Meow Meow

Meow Meow is composed of two separate systems, the environment monitoring system and the interactive feeding system.

Fig. 1   *Meow Meow,* a smart pet interaction system

Section 2 - Environment Monitoring System

- **Climate module**
  - monitor the temperature and humidity
  - update *climate/temperature* and *climate/humidity* in Firebase realtime database
  - update *climate/hot* to true when the temperature rises over 28°C and update *climate/hot* to false when the temperature drops below 25 ^{o}C.

- **Relay module**
  - control the fan and the light bulb
  - automatically turn on the fan when temperature rises
  - automatically turn on the light at night(18:00~06:00) and turn it off at daytime(06:00~18:00)
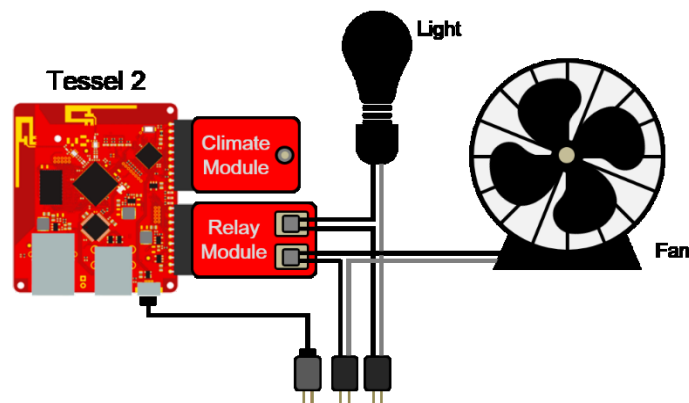 - enable clients to send request to control the fan and the light bulb

Fig. 2   System structure of the environment monitoring system

Fig. 3   Environment monitoring system

Section 3 - Interactive Feeding System

- **Server**
  - establish a local host using socket.io

- **Button(via GPIO)**
  - enable your pet to call you

- **Servo module**
  - control the direction of the camera
  - control the pet food dispenser

- **USB camera module**
  - stream live video

- **USB audio module**
  - play recorded voice message when you call
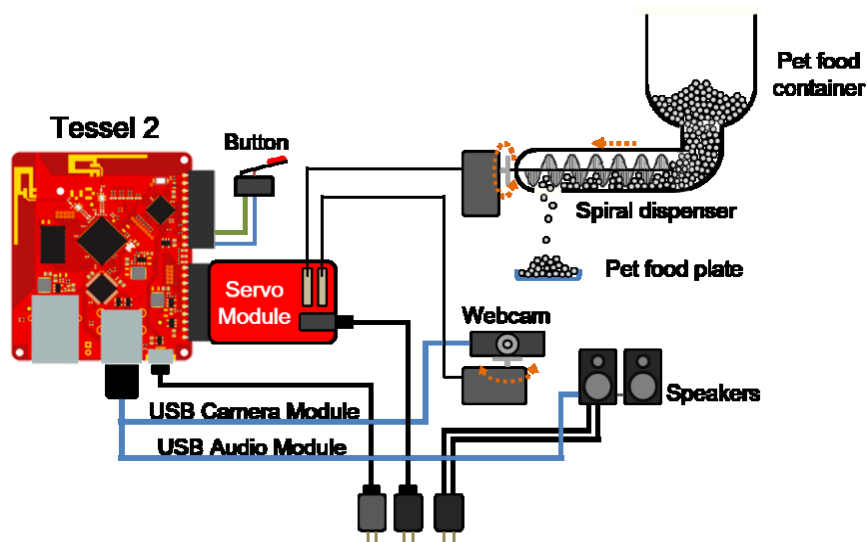 - play recorded voice message when you feed remotely

Fig. 4   System structure of the interactive feeding system

Fig. 5   Interactive feeding system
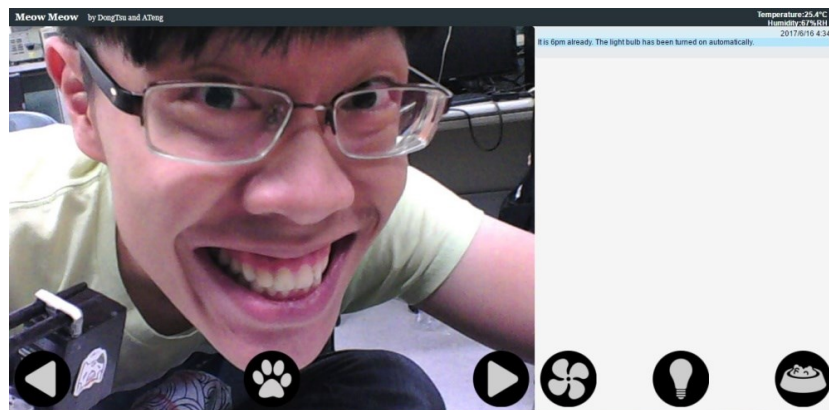
Section 4 - User Interface

Fig. 6   User Interface

❧ **Firebase API**
- ❧ connect to Firebase realtime database
- ❧ fetch climate data updated by the environmental monitoring system
- ❧ acquire the state of relay module of the environmental monitoring system
- ❧ send relay control request when the fan/light buttons are clicked(will be elaborated in Sec. 5)

❧ **Message List**
- ❧ show messages when your pet calls you by pressing the button
- ❧ show messages when the temperature rises over 28°C
- ❧ show messages when the light bulb has been automatically turned on at night
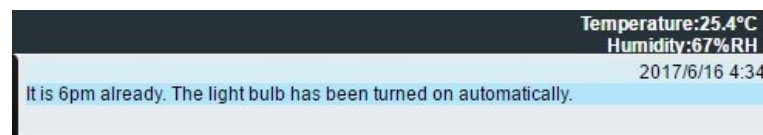- ❧ show date and time information of the messages

Fig. 7   Message list and climate information bar

❧ **Buttons**

- ❧ Camera control
  - ❖ trigger the servo module
  - ❖ adjust the direction (left/right) of camera

- ↬ Call meow 🐾
  - ❖ trigger the audio module
  - ❖ your pets will hear your prerecorded voice
- ↬ Fan switch 🌀 ↔ 🌀
  - ❖ trigger the relay module
  - ❖ turn on/off the fan
- ↬ Light switch 💡 ↔ 💡
  - ❖ trigger the relay module
  - ❖ turn on/off the light
- ↬ Feed button 🥣
  - ❖ trigger the servo module
  - ❖ activate the feeding system
  - ❖ trigger the audio module
  - ❖ your pets will hear your prerecorded voice

Section 5 - Implementation Details

How do we use Firebase API to establish robust connection?

We try to construct a request/response connection model between the browser(which acts like a client) and the environmental monitoring system(which acts like a server).   To illustrate the idea, we take light control for example and some trivial checks are skipped.   Note that true means 'on'/'turn on' and false means 'off'/'turn off' for *relay/status.lightIsOn and relay/command.switchLight*.

- Whenever the user click the light bulb button, the client will check if *relay/command.switchLight* is equal to *relay/status.lightIsOn*.   If so, then the client will change *relay/command.switchLight* into the target state.   If *relay/command.switchLight* is not equal to *relay/status.lightIsOn*, it means the server has not completed the last command sent by the clients so we simply skip it..

- The server listens on *relay/command.switchLight*.   Whenever its value is changed, the server will change the relay controlling the light bulb into the target state.

- After the server has successfully change the state, the server will change the *relay/status.lightIsOn* into the current state of the relay controlling the light bulb.   Note that this is why we say if *relay/command.switchLight* is not equal to *relay/status.lightIsOn*, it means the server has not completed the last command sent by the clients.

- The client listens on *relay/status.lightIsOn*.   Whenever its value is changed, the client will change the unlighted light bulb image into lighted light bulb image or in the opposite way.
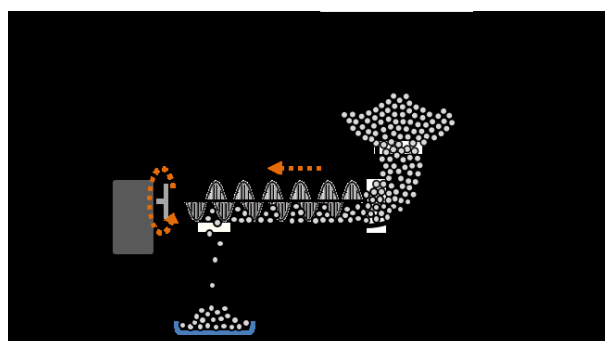
Close-up of the mechanism of the pet food dispenser

Fig. 8   Close-up of the pet food dispenser