Development of a path-following method combining AI and app*

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***Abstract*—The paper focuses on the incorporation of the existing state flow design into the AI and App for the path following in the solar plant location. Firstly, the mobile platform of the 4 wheel can be moved in the solar plant location where the destination is generated using artificial intelligence (AI) and the app. Secondly, the destination signal is sent to MATLAB and the mini version 4 wheel ranger 2 platform is moved based on AI and app information. The input $v(t)$, $w(t)$ to output $x(t)$,$y(t)$,$h(t)$ are generated for the following generated path. At this point, the existing state flow design method is incorporated into switch block to select the optimal path for the designated destination.**

***Index Terms*—Ranger mini version 2 mobile platform, Artificial intelligence, Destination number, Automatic gain**

I. Introduction

The artificial intelligence method is collaborated with the control of the 4 mobile wheel platform in [1]-[4]. The 4 mobile wheel platform has been researched over years. To improve accuracy, the previous study is implemented for 4 wheel mobile platform in [5]-[15] .

Taking advantage of the aforementioned method into account, this study proposes the design of the state flow method incorporated into the switch block and the automatic gain optimization during experimentation. Using the proposed method, artificial intelligence sends the destination data to MATLAB, and then automatic gain optimization is implemented to change the direction of the 4 wheel ranger mini version 2 platform.

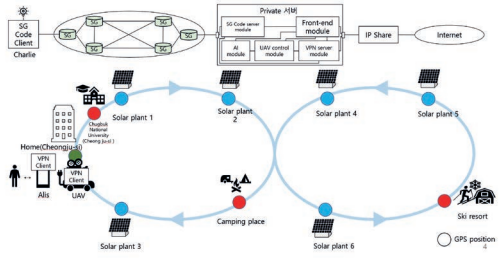

Fig. 1. The overall system architecture and experimental condition

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II. The experiment of the 4 wheel mobile platform using MATLAB/Simulink

To enable communication between the app and MATLAB, a TCP/IP server is opened in MATLAB, allowing data to be transferred from the app. The command $set\ param("data2/Gain", Gain\ =\ "data2")$ updates the Simulink model with new data during simulation. This enables the platform to follow a path from Scenario 1 to Scenario 2 during experimental implementation. When the user sends number 1 via TCP/IP, the 4 wheel mobile platform moves to position 1, corresponding to Solar Power Plant 1. Later, during the experiment, if the user sends the number 2 through the app, the platform moves to Solar Power Plant 2. The general scenario is illustrated in Fig. 1.

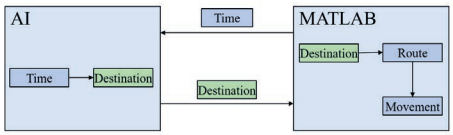

Fig. 2. The overall scenario for the path following of the specific destination

The mobile 4-wheel platform continuously moves during an infinite simulation. When the numbers $1, 2$, or 3 are entered, the rotary switch in Fig. 4 updates according to the number received from the app and artificial intelligence.

III. Method of opening MATLAB server, sending a message from Android app

The MATLAB server is launched to receive a specific number determined by the AI's preference. The aspect of the Android app is given in Fig. 5. The number specifies the destination of the solar panel. ? in the app specifies the inquiry to the AI(artificial intelligence), which is Python in our case. In MATLAB, the IP address and port number are specified in the code. The method of opening MATLAB server and getting

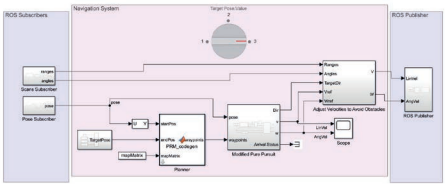

Fig. 3. The number based Simulink model

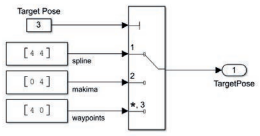

Fig. 4. The switch based on the way point preference

the preferrable number is shown in Appendix in terms of code in MATLAB.

IV. Conclusion

In the presentation, the state flow method is integrated within the switch block to determine the appropriate destination based on AI and App inputs. Utilizing this design along with the ROS network, a suitable path is generated, which the 4-wheel Ranger Mini mobile platform follows. The experiment and algorithm are implemented and demonstrated using MATLAB/Simulink and a ROS-enabled Ubuntu PC.

V. Appendix

```
   port = 224;
serverSocket = java.net.ServerSocket(port);
fprintf('Waiting for client to connect...');
clientSocket = serverSocket.accept();
fprintf('Client connected');
inputStream = clientSocket.getInputStream();
outputStream = clientSocket.getOutputStream();
data = char([]);
data = [data, inputStream.read()];
data2 = str2num(char(data));
fprintf('Received message=
set_param("data2/Gain", Gain = "data2")
```


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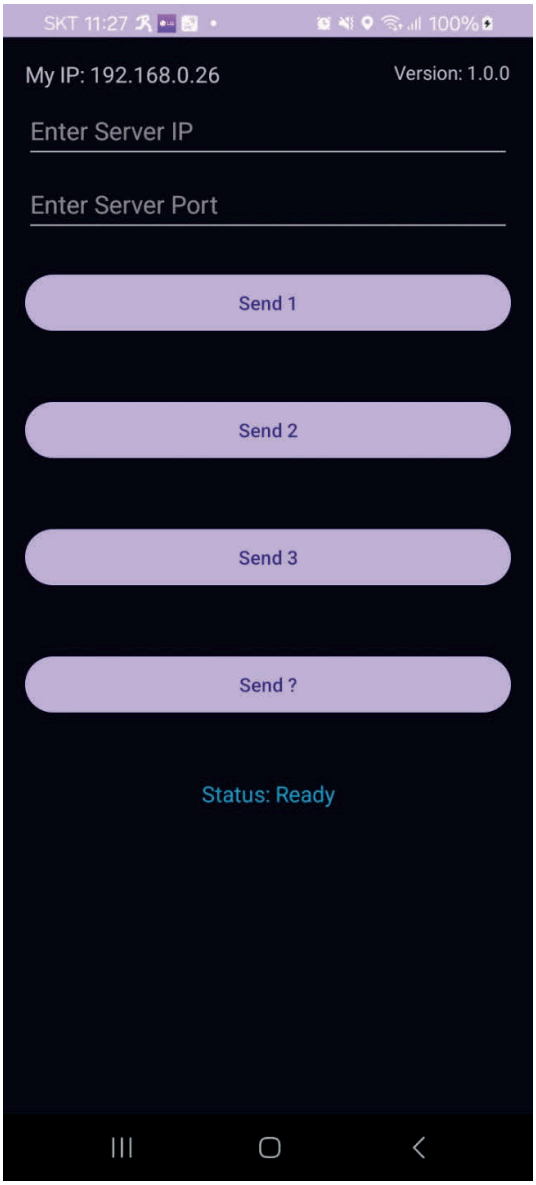

Fig. 5. The aspect of the android app

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