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Research paper

Arduino Object Follower with Augmented Reality

T. Prem Jacob[1], A. Pravin[2], P. Asha[3]

[1]*Department of Computer Science and Engineering, Sathyabama Institute of Science and Technology.*
[2]*Department of Computer Science and Engineering, Sathyabama Institute of Science and Technology.*
E-mail:pravin_ane@rediffmail.com
[3]*Department of Computer Science and Engineering, Sathyabama Institute of Science and Technology.*
E-mail:ashapandian225@gmail.com
**Corresponding author E-mail:premjac@yahoo.com*

Abstract

This research works we use augmented reality SDK to find the walls and ceilingwhich it sends back to your workstation giving you a digitalrepresentation of your environment.This research work utilizes an Arduino robot running an ESP- 8266 Node MCU that conveys with anandroid mobile phone. The android mobile run an application made in the computer game application Unity 3D. The robot will follow an object using Vuforia's client targets so you can make a trackable object at runtime as long as it has sufficient feature points. We have used the Apple's ARkit for identifying the horizontal and vertical planes.

Keywords: *Augmented reality, ARkit, node MCU, Vuforia, Unity 3D.*

1. Literature Survey

A vital issue that can be comprehended by Computer Vision calculations is figuring a 3D remaking of a scene captured by a standard camera. A few fake markers frameworks are accessible as PC libraries with various methodologies of camera posture estimation, in spite of the fact that their capacities are as yet unexplored by Simultaneous Localization and Mapping (SLAM) arrangements. This work exhibits an answer for the issue of SLAM utilizing counterfeit markers. The consequently registered camera postures by the ARUCO library are surveyed on information portraying ordinarily experienced situations in Robotics and Augmented/Virtual Reality applications [1].

We display a general technique for constant, vision-just single-camera synchronous localization and mapping a calculation which is relevant to the localization of any camera traveling through a scene and contemplate its application to the localization of a wearable robot with dynamic vision. Beginning from exceptionally meager introductory scene information, a guide of normal point highlights spreading over an area of a room is produced on-the-fly as the movement of the camera is at the same time assessed in full 3D. Normally this allows the comment of the scene with inflexibly enrolled designs, yet facilitate it licenses programmed control of the robot's dynamic camera [2].

The AR see alongside mapped markings on the joystick give the client a reasonable idea of the impact of their joystick developments on the end-effector of the robot. All camera sees show this enlisted dynamic overlay data on-request [3].

The common strategies depend on shading data which isn't hearty to objects with skin shading, skin color contrast, and light condition varieties. Hand division technique for hand-question communication utilizing just a profundity outline. It is testing a direct result of the little profundity contrast between a hand and questions amid a cooperation [4].

Minimal effort indoor robots are currently utilizing wide-point cameras to help route, yet as a rule this is constrained to position estimation by means of inadequate element-based SLAM. Such robots typically have minimal worldwide feeling of the measurements, outline or characters of the rooms they are in, data which would be exceptionally valuable to empower conduct with significantly more abnormal state knowledge [5]. We can enlarge an omni-directional SLAM pipeline with clear thick stereo estimation and basic and hearty room display fitting to acquire quick and solid estimation of the worldwide state of regular rooms from short robot movements. We have tried our strategy widely in genuine homes, workplaces and on manufactured information. We likewise give cases of how our technique can reach out to making composite maps of bigger rooms and recognizing room changes.

The proposed arrangement means to address the issue of exact investigation and mapping of structures and situations for which an earlier model exists however isn't precise, possibly obsolete, or does not encode essential highlights and semantics, for example, comprehensible signs and other surface data [8]. To approach the issue, the robot processes an improved assessment way given any earlier learning of the earth, while the human administrator uses the live camera sees and the ongoing determined 3D delineate to locally alter the reference direction of the robot, with the end goal that it visits a refreshed arrangement of perspectives which gives the coveted scope of the genuine condition and adequate spotlight on specific highlights and points of interest [6]. A self-ruling aeronautical robot fit for route and mapping in GPS-denied situations is utilized and joined with the Augmented Reality interface to tentatively show the capability of the approach in auxiliary assessment applications.

The vast majority of these applications would improve the situation if various gadgets are utilized as a part of an appropriated setting. The appropriated SLAM research would profit if there is

where the complexities of system correspondence is now taken care of [8]. We present such structure using open source Robot Operating System (ROS) and VirtualBox virtualization programming. Moreover, we portray an approach to gauge correspondence measurements of the dispersed SLAM framework.

The test system gives us a chance to quantify under what conditions a robot influences somebody to feel charmed, or frightened, or unconcerned, stretching out to nonhumanoid the investigations of feeling that have been improved the situation robots with outward appearances [9]. This better model of how the virtual robot is seen lets us spryly enhance its appearance and conduct, containing the combinatorial blast of parameters to examine in costlier genuine examinations. The living arrangement and the robot are rendered with Unity and saw with an Oculus Rift. Sound comparing to flight moves is resynthesized from accounts of a real quadrotor [10]. Flight elements utilizing L1 versatile control keep running in MATLAB and Simulink [11]. Through menus worked by a Leap Motion hand tracker, the human subject summons the quadrotor to travel to different rooms, along precomputed ways that dodge crashes. The flight way is changed through a scientific mapping to Laban Motion Factors to incite a scope of reactions.

2. Proposed Work

This research works we use an augmented reality SDK. Using this we find the walls and ceiling and it sends back to your workstation giving a digital representation of the environment. This research work utilizes an Arduino robot running an ESP- 8266 Node MCU that conveys with an android mobile phone. The android mobile run an application made in the computer game application Unity 3D that has 3 things:
Enables you to drive around the robot with a camera feed returning to your PC. You can utilize the arrow key to move it around toward any path and the video feed permits you to continue driving when the robot is beyond anyone's visibility.
Enables the robot to track anything you put before it. You can tap the screen to instate the tracker and after that the robot will chase the object.
Enables you to drive the robot with your Personnel Computer utilizing the arrow key. The application utilizes an increased reality SDK to discover the dividers and roof which it sends back to your workstation giving you an environment with digital representation.

3. Experimental Setup

Node MCU

It depends on the chip esp8266. It has WIFI and microcontroller.ESP8266 NodeMCU, Arduino equipment IO, 10 GPIO pins, Event-driven API, PWM, IIC, SPI communication, ADC.

Motor Driver

L298N H is a Dual Motor Controller for Arduino. This enables you to control the speed and course of two DC motors. The L298N can be utilized with the motors that have a voltage 5 and 35V DC.

Fabrication

We fabricated the robot with the help of 3D printed parts. The motorsare fixed in the proper direction and the wheels are attached to the motor gear shaft. The motors are fixed with the base of the robot with screws and the ESP 8266 MCU node, motor driver l298n, battery is fixed firmly to the base.
The second9-volt battery is placed underneath the robot. We have placed a power bank to the underside to the 9V battery keeping in mind to control the Node MCU independently for prolonged battery life.The mobile holderis setup to utilize a "L" formed bit of plastic.

Connections

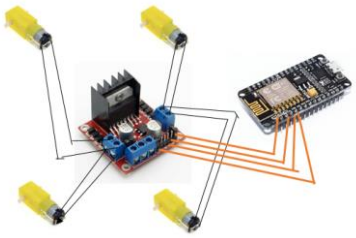

Fig. 1: Connection to IOT

To interface the Arduino and motors we utilized a l298N H motor driver board. This enables to turn the motors in various directions so our robot can turn toward any path. This motor take in up to 12 volts and has a voltage controller which transforms 12v to 5V, which drives the Arduino.
Interface everything as indicated by the block diagram as in figure1. Ensure the motors are confronting a similar course. The motors can be wired in such a way that we can turn the robot to the desired direction by powering one motor in forward and the other reverse so that we can move the robot as expected.
This is on the grounds that the motor controller board considers a most extreme of 3 motors. Indeed, even so with two dc motors we can at present get this thing to turn toward any path by influencing the two sides to go in inverse ways.
When you are good to set to go, alter the code in the subsequent stage to utilize your network name and secret key. Node MCU can interface with your WIFI and it can send and receive packets of data to the workstation and the pc.

Connecting Devices to the Wi-Fi Network

Communication between the pc, android mobile is through the Wi-Fi network. The robot module plugged by means of USB open up the serial monitor in the Arduino IDE and configured to 115200 BAUD rates. Reset the Node MCU so that board interface with the system in seconds.

Fig. 2: Connecting devices to Wi-Fi network

IP Address of the node MCU is found to uniquely identify the device from another network device. We have used the same IP address to our Unity application.

Camera

Initially open up the camera. In the event that you look on the ARCamera the server content is the thing that takes the video feed from Vuforia Value of Augmented Reality and streams it to the PC by means of TCP.
The controller scene is the thing that gets the video stream and furthermore enables you to utilize the arrow keys to control the robot. Before you can utilize this ensure your pc and android mobile devices are associated with a similar WIFI arrange. Go to the video Client and put in your android mobile IP address there. Presently go to the console input amusement protest and put in your Node MCU's IP address in the send message content.
Begin the camera scene on the android mobile and after that once that is as of now running press play on the controller scene in the editorial manager and you now have the capacity to drive around. The quality is good for execution purposes however you could knock it up in the server content of the camera scene in the event that you needed to.

Object Tracking

Here we use Vuforia's client targets so you can make a trackable object at runtime as long as it has sufficient feature points. On the robot we have to use the IP address of the Node MCU in the send message content. Use some sort of object before the camera of the android mobile and tap the screen to track that object.In the event that the picture has good feature pointsthen the object will be tracked.

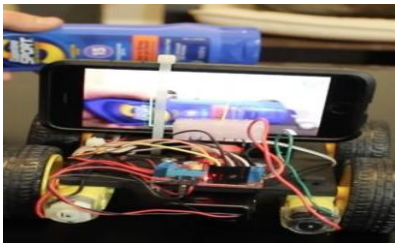

Fig. 3: Object tracking

It is noticed that the battery voltage gets decreased the tracking performance of the device. On the off chance that we open up robot take after conduct you will see that this content just checks if the present picture target is inside a specific bound of limits and on the off chance that it isn't it sends a message to the robot to move for one casing previously halting. This doesn't bring about the smoothest conduct yet it works truly average.[12]

Mapping

Presently this last scene utilizes Apple's ARkit since we need to identify horizontal and vertical planes, so it will just work on IOS. We need to open the mapping and make sure that PCs IP address is provided on the script Send Message Behavior .cs . This content sends the name, position, turn, and size of the created planes back to your PC as ARkit instantiates them. This gets got from the Map Controller scene where every one of the planes will be shown on your PC. Here try to put the IP address of your Node MCU in the send message content, so that we can drive it with the help of arrow keys.

Android Application

First, we have to make some settings like go to file, build settings, player settings and put in something for your bundle identifier. Also, make sure there is something in the box for camera usage description. If you are building for Android go to build settings and switch your platform to Android, uncheck Android TV in your player settings. Hit build and run with your phone plugged in. If you are building out to an iPhone or and iPad, make sure to download Xcode from the app store. Also, sign up for a free apple developer account from www.apple.developer.com. Go to file and hit build. Open up the file that was created from Xcode and plug in your phone. [13]

4. Conclusion

Thus by using the augmented reality we found out the walls and the digital representation of the operating environment is successfully found. The object training and tracking is done using the mobile application that drives the robot following the object using the unity 3D application. The feature points are extracted at run time so that the robot can able to follow the object. We have used the Apple's ARkit for identifying the horizontal and vertical planes. In the future work this can be extended to an iPhone or an iPad.

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