War Field Surveillance by using Leap Motion Control Sensing Drone

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Abstract— Some technologies are being used in day to day life to reduce the human effort that means the interfacing between machine and man is take place that increases the application range of the systems we use a leap motion to improve the system parameter analysis and the range of application. Leap motion sensor is a new gadget having three Infrared sensors to catch the gestures of hands and fingers precisely to a millimeter in three-Dimensional space. By utilizing the data from the leap motion gadget and calculating inverse kinematics for the data using a java program. Drone is Amazing invention which is Very helpful in doing complicated task with more easier. Now a day's drone are used in Search and rescue systems , Security and military applications, Aerial photography & video and Surveying because of their accurate result and tendency to do repetitive and more time taking task efficiently. To enhance system performance we are using drone but in modern era controlling Drone system manually is less efficient .The main concern is to create a system which is helpful for controlling Drone manually from remote location This kind of system might be beneficial in military applications and space research. Drone control using gesture is getting popular in existing system of sixth sense technology 2d camera is used which is not gave precise output. As remedy of this drawbacks like background conflict and light intensity problem we are using 3d leap motion controller for hand gesture recognition. where gesture recognition in three-dimensional is very precise and it has great enhancement on the speed where after receiving signal of gestures from user's input and drone will work on input given.

Keywords: Quad Copter, Infrared, Surveillance, Leap Motion Controller, Hand Gesture

I. INTRODUCTION

Motion capture of the human hand is very complex because each finger and even each phalanx, has distinct and independent movements. Over time, various solutions to this problem have been identified and new Technology for Motion capture of the human was first develop in 2008 and the device known as Leap motion. In 2016 The Company release the new software designed for hand tracking in virtual reality. Today various researchers and scientists are interested in exploring the various applications of UAVs among all the variants of UAV family, quad copter is the one which is most feasible and easy to construct. It is because this design of a quad rotor is autonomous in nature (protects human life) and it is responsible for its take-off and landing itself. Quad copter is controlled by four rotors via propellers. It is closed loop controlled and feedback biased, thus very stable in nature. As we know this model has 4 rotors, so for the motion of the quad copter the 4 rotors are used to push the air downwards and thus creating a thrust in order to keep the quad copter aerial. The orientation (position) is controlled by the FCU (Flight Control Unit). FCU is the heart of the quad copter's control system. It works by controlling different motors with relatively different outputs (Pulse Width Modulated Signals).UAV's movement is controlled by a HMI (Human Machine Interface).This paper also describe the design methodology of the quadcopter. UAVs (unmanned aerial vehicle) are basically radio controlled helicopter which are highly used for searching remote areas. They are used in remote sensing operation, surveillance and other purposes but in this project we control the drone by hand gesture. In this project leap motion is used for control the drone. The controls are designed to be as natural and intuitive as possible, that being said I should mention that this concept is originally designed for quadrocopters but should feel very natural for both airplanes and helicopters. The beauties of Leap to Arduino to Tx are that it requires no alteration of you current R/C hardware/setup (meaning you don't need to modify your transmitter) and at the same time allows you, with the flip of a switch (the training toggle on your controller), to retake control using your original transmitter .program is also relatively straight forward to setup (regardless of their prior programming/computer skills) while being very cheap (depending on what you already yow of course) and platform independent.

A. *Need of Project Work*

Leap motion is used to control the drone by using hand gestures. Drone can be used for Rescue operations where approach of human is not possible. Drone include search, rescue, fire, wildlife, ecological monitoring, deep ocean surveillance etc. Our drone is designed at low cost as well as with high efficiency. This project is to give the way for providing bigger effective drone for military application.

B. *Objective of the Project*

Control the Drone using hand gestures with the Leap Motion device. Use Kinects to detect and track the drone position. Track and simulate the drone movements in JAVA. Use Kinects to detect and track the drone position. Track and simulate the drone movements in Java-SDK. To control the very efficiently by hand gesture.

II. SYSTEM DEVELOPMENT

A. *Block Diagram*

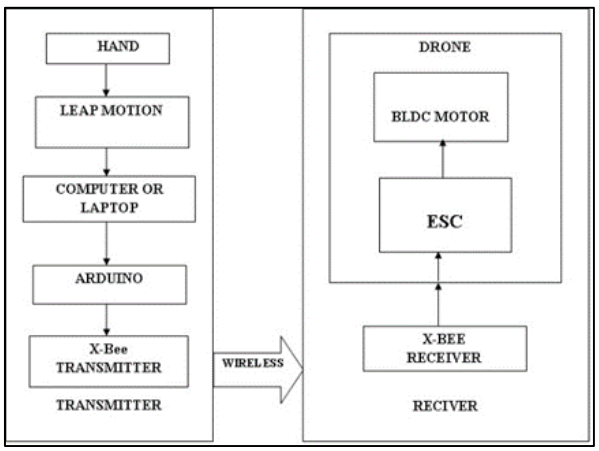


Fig. 1: Block Diagram of Leap Motion Controlled Drone

B. Working

Hand is used as a input to leap motion sensor leap motion recognizes the input hand and leap motion sense the given coordinate of the hand that means the XYZ coordinate as the input changes the coordinate of the input is also changes and produce the values accordingly that. 2. The readings are given serially to the computer using cylon.js. It is a JavaScript framework which used to print the values on the computer.
The values were being given to the computer is used for the output and the decision making is obtained by that values. 4. Then that action which is produced by the Arduino is passed control signal through the X-Bee transmitter which is used for radio communication and the result is transferred X-Bee receiver and the drone is operated. The Leap Motion uses IR-lights to get a 3D depth map of your hand at about 300 times per second with a very high accuracy in range of 1.5 feet with an angle of 270 degree. Using the data that the sensor acquires from scanning the hand the Leap figures out which part of the hand is which and sends it over to the computer via USB. The values are then received (about 20 times per second) calculated, translated, mapped, checked and visualized before they are sent, over USB, to the Arduino. This is also where the user gets the feedback from his/hers input and make all the configurations before the flight. The values from the computer are received and then converted to a PPM signal with very low noise. This signal is then sent, about 50 times per second to the transmitter via a 3.5 mm cable plugged into the trainer port on the transmitter Since the data is coming in via the trainer port, the transmitter believes that it is connected to another transmitter (of the same- or similar model) while it's really connected to Arduino emulation to be another transmitter. This allows the values to be sent, just like normal, to the drone. The drone on the other hand has no idea who or what that is controlling it, it only cares about the values that are being transmitted and acts accordingly.

III. HARDWARE DETAILS

A. Leap Motion

1) Designed Features:

Based on previous raw data we collected from Leap Motion Controller API, we starts to build features to recognize hand gestures. These features could mainly be divided into two parts. One parts are associated with static gestures containing the positions and directions. The others are used to identify dynamic gestures.

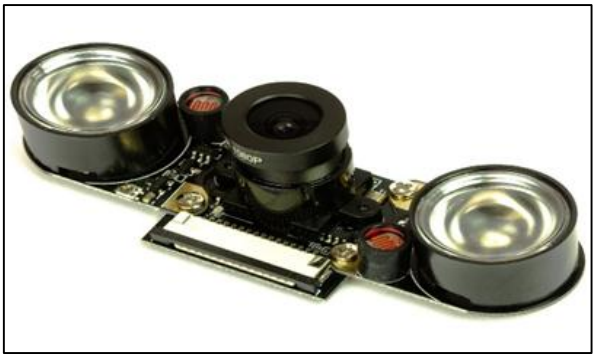
2) Static Gesture

Features for static gestures are mainly built based on palm and fingers relative distances. Distances between fingertips Fi pos and palm center P pos. Distance between thumb F0 pos and index F1 pos. Distance between index F1 pos and F2 pos.

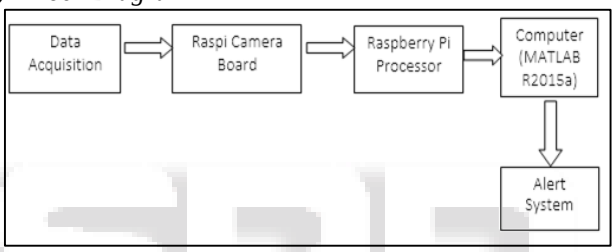
3) Hand Rotation Feature

Palm Rotation Features contains two parts. One is the difference of current palm normal P t N and previous palm normal P t−1 N defined by DPN. The other parts is the angle between difference of current palm DPN and hand direction PD.

B. Night Vision Camera



1) Block Diagram

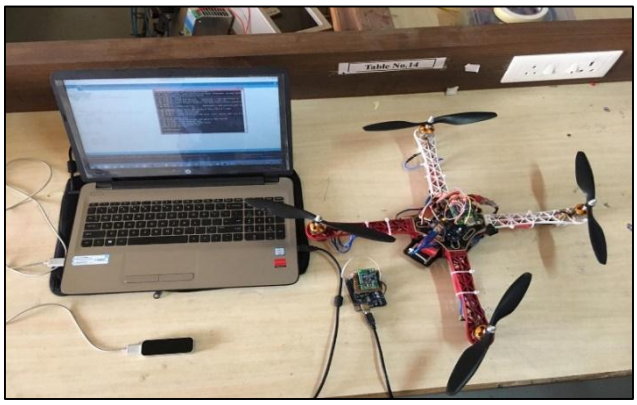


2) Algorithm:

1) War Field Video Acquisition using Raspi Camera Board
2) Send acquired video to PC through Raspberry pi Processor
3) Framing of Captured Video
4) Background Subtraction
5) Foreground Estimation
6) Movement Detection using Optical Flow Method
7) If motion detected, estimate the motion vectors

3) War Field Footage

C. Working Model



IV. Conclusion and Future Scope

To summarize, first the project was introduced, then the development process was described, after that came an evaluation of the development's results. It was mentioned in the introduction that drones are becoming increasingly popular in commercial use; for that reason it is a growing and exciting field to get into, therefore precedents are not very common. Thus choosing this project was somewhat risky, but it turned out to be an educational and entertaining experience. The objectives and requirements planned were a little ambitious, however that provided a valuable learning opportunity for future work. In addition, assessing the available hardware options to determine which is more suitable benefited the project and reduced the complexity of development.

A. Future Scope

Would like to expand this project sometime in the future; here are some ideas I have:

1) Add more ways of controlling, maybe a Joystick or a simple Keyboard.
2) Add Cameraman-control/mode.
3) Add left hand control.
4) Take the Arduino auto of the equation and use the AUX port on the computer instead.

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