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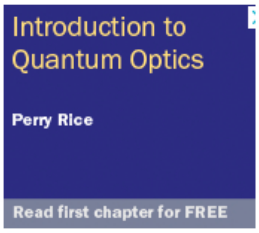

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Remote Control Target Tracking Using GPS / INS-IMU

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Abstract. Background of this research is the need for the remote control to direct a bullet to a known target in advance of the coordinates, with an initial velocity, and initial momentum of the bullet flying the farthest possible. Method of developing remote control target tracking uses GPS sensor devices. By using a radio receiver and CPU, GPS data can be received where there are some data that can be used directly and some are processed first to be used, including position data directly sent to the base as control host and plotted on maps, altitude data or altitude is directly used to control the altitude, the direction of the bullet is calculated using the position data every second from the GPS and compared with the GPS direction data attached to the bullet, used to correct the direction of the bullet, where the data that is executed is the delta heading for calculation with the heading GPS. Remote control target tracking using GPS worked fine, according to the target coordinates as reference. Emphasis on research is how to calculate the real-time server heading, and compare it with the heading from a compass sensor mounted on the bullet.

1. Introduction

The background of this research is the need for the remote control to direct a multi-functional bullet to a known target in advance of the GPS/INS-IMU(Global Positioning System/Inertial Navigation System- Inertial Measurement Units) start coordinates (latitude, longitude) [1][2][3][4], the required distance for radio remote control ranges from 50. Up to 60 km, the propulsion energy from the bullet is obtained from the initial ejection energy, and the range of the bullet to fly is expected to be between 20 to 30 km with a travel time of 20 to 30 minutes [5][6][7][8]. The initial velocity of the bullet is around Mach 2, comparable to 2 x 300 m / s = 600 m / s, the energy of the bullet to fly is only with impulse energy or initial momentum, without any additional thrust from the bullet while flying. For this reason, maintenance of the momentum energy of the bullet is needed so that it has a maximum range. Note: 1 match = 1225.04 km / h = 295.0464000003 m / s. The target position is input via the keyboard.

2. Method

This research method uses bullets that have been made and have met QC rules as bullets pass aerodynamic and mechanical flight tests, while this research only focuses on research to develop remote control target tracking using GPS / INS-IMU. By using a radio receiver and CPU, GPS / INS-IMU data can be received where there is some data that can be used directly or processed first to be

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used, among others, the position data in is sent directly to the base as a control host and plotted on a map, altitude data or direct altitude used to control the altitude, the direction/heading of the bullet is calculated using the position data every second from the GPS / INS-IMU and compared with the direction / heading data GPS / INS-IMU attached to the bullet, used to correct the direction of the bullet where the data at execution is the delta heading for calculation with the heading GPS / INS-IMU. The data retrieval process is available every second from the GPS / INS-IMU, but the retrieval process for control is according to the processing time carried out by the CPU, considering that controlling mechanics is certainly not as fast as the speed of electronic sensor signals, so a lot of real-time GPS / INS-IMU data is not used in the process bullet control. The main tools needed: a pair of transparent radio control with RS232C protocol, server CPU, CPU host, GPS / INS-IMU radio receiver + compass + 3 D sensor with CPU + RS232C protocol, 1 geared dc servomotor wing, 4 geared dc servomotor fin. The host has full authority, to turn off the power geared dc servomotor and tune the target if deemed necessary [9][10][11]][12].

3. Results And Discussion

3.1 Results

The following figure shows the results of research and carrier of bullets at :

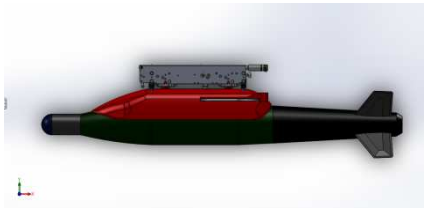

Figure 1. Bullet clamping

Figure 2. Bullet clamping

Figure 3. Bullet release

Figure 4. Bullet flying

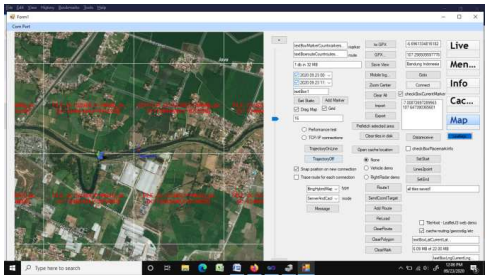

Figure 5. Target Tracking dashboard

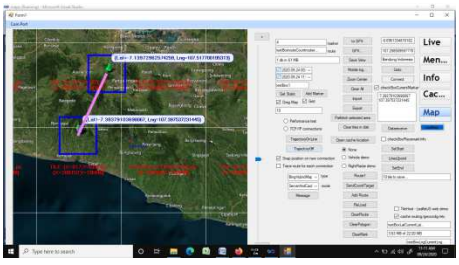

Figure 6. A distance of about 20 km

Figure 7. A distance of about 20 km zoom

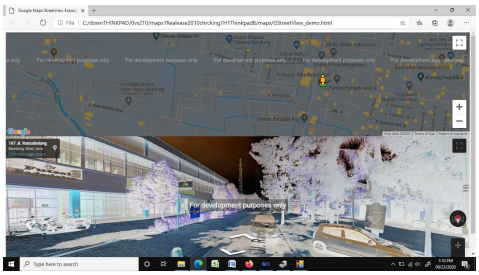

Figure 8. Target and details

Figure 9. Sukhoi SU24 carrier for bullet

Figure 10. F16 fighting carrier for bullet

According to of figure 6. is initial coordinates (south latitude, east longitude) (-7.35974291982731, 107.492980957031), target coordinates (south latitude, east longitude) (-6.76280647497146, 107.968139648438), host coordinates (south latitude, east longitude) (-7.25349605006953, 107.893981933594) and bullet server coordinates according to with (latitude, longitude) real-time of bullets.

Emphasis on research is how to calculate the real-time server heading, and compare it with the heading from a compass sensor mounted on the bullet**[13]][14].**

3.2 Discussion

Discussion, if the bullet assumes QC passed, the success rate of control is largely determined by the calculation of headings on the server, assuming the headings on the server are from the sensor device at al: compass + 3 D sensor, radio receiver GPS / INS-IMU sensor in the manufacture, where it is believed to function properly, because the device has been on the global market for quite a long time, with various kinds of Frequency Ask Questions(FAQs) that have been obtained. Geared dc servomotor control greatly determines the accuracy of the bullet reaching the target because the GPS / INS-IMU + compass + 3 D accuracy sensor is quite accurate up to a radius of 1-meter accuracy.

4. Conclusions and Suggestions

4.1 Conclusions

Conclusions on research developed the real-time remote control target tracking using GPS / ins-imu is running in function normally**.**

4.2 Suggestions

The time remote control target tracking using GPS/ins-imu is easy to handled and used for that research hoping any industry should be applied to this remote control target tracking using GPS / ins-imu.

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