Accelerometer Controlled Stable Mobile Platforms Using 8051 Microcontroller

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Abstract- Accelerometer controlled stable platform is an innovative technology. It will be developed with the help of accelerometer module. And it is use in ship/air plane for medical applications. This system has a DC motor, motor driver & microcontroller. This system detects the position of the platform i.e. left down, right down, front down & back down and moves the platform towards stable automatically with help of DC motor. Accelerometer is used for to detect the hand position. Microcontroller and Embedded system perform main role in this project. As per accelerometer situation microcontroller drive platform automatically.

Index terms- Accelerometer, Tilt, and Microcontroller.

1.INTRODUCTION

The objective of this development is to provide relative navigation capability between air plane and ship using minimally modified commercial equipment at a reasonable cost[1]. Sensing equipment, such as electronic imaging devices, cameras, radar, navigation instruments, and the like are frequently carried by and operated in a moving vehicle, such as an airplane, that undergoes rotational motion about its center of rotation In such an environment, the equipment is typically mounted on a movable platform that is stabilized with respect to vehicle movements. The stabilization may be about one, or more, of the vehicle axes [2].Accelerometer controlled stable platform is an innovative technology. It will be developed with the help of accelerometer module. This system has a DC motor, motor driver & microcontroller. This system detects the position of the platform i.e. left down, right down, front down & back down and moves the platform towards stable automatically with help of DC motor.

Basically self-balancing platform consists of platform which is balanced by movement of two motors in opposite direction to the movement of the platform. Accelerometer senses the tilt position and give instruction to the respective servo motors to rotate by certain angle depending on its previous position to balance or control the platform.

2.LITERATURE SURVEY

Platform stabilization is more important in most of the large scale applications like the oil well and nuclear product based processing machines and

Systems. So stabilization of that machinery is more important, failing to do so may cause a major damage to the society and which may even lead to an accident. Hence to avoid those kinds of accidents and damage, manual monitoring of those large systems and making necessary changes is practically impossible.

3.SYSTEM DESCRIPTION



Fig.1 General Block Diagram

Fig.1 shows the block diagram of accelerometer based stable platform for ships. Accelerometer is used for to detect the tilt position. Comparator takes X & Y axis data from accelerometer and compare with reference data. And o/p of comparator is given to the microcontroller. Microcontroller perform main role in this project. As per accelerometer situation microcontroller drive

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platform automatically. The DC motor is connected to the microcontroller. DC motor is used for movement of the platform. Microcontroller is not able to drive the motor directly so to drive the motor we need a motor driver.

3.1TRANSMITTER



Fig.2 Transmitter

3.1.1 ACCELEROMETER CIRCUIT

The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. The product measures acceleration with a minimum full-scale range of ± 3 g. It can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion, shock, or vibration. The user selects the bandwidth of the accelerometer using the CX, CY, and C Z capacitors at the X OUT, YOUT, and Z OUT pins. Bandwidths can be selected to suit the application, with a range of 0.5 Hz to 1600 Hz for the X and Y axes, and a range of 0.5 Hz to 550 Hz for the Z axis. The ADXL335 is available in a small, low profile, 4 mm × 4 mm × 1.45 mm, 16-lead, plastic lead frame chip scale package.

3.1.2COMPARATOR(LM339)

These comparators are designed for use in level detection, low –level sensing and memory applications in consumer, automotive, and industrial electronic applications. It is used with power ratings of ± 36 or ± 18 & ± 30 or ± 15 and Storage Temperature Range from –65 to $\pm 150^{\circ}$ C. These quad comparators feature high

gain, wide bandwidth characteristics. This gives the device oscillation tendencies if the outputs are capacitive coupled to the inputs via stray capacitance. This oscillation manifests itself during output transitions (VOL to VOH). To alleviate this situation input resistors < 10 k should be used.

3.2RECEIVER



Fig.3 Receiver

3.2.1MICROCONTROLLER

The AT89C51 is a low-power, highperformance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The devices manufactured using Atmel's high-dens ity nonvolatile memory technology and are compatible with the industry-standard MCS-51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.

3.2.2MOTOR DRIVER

The L293 and L293D are quadruple highcurrent half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high current/highvoltage loads in positive-supply applications.

3.2.3VOLTAGE REGULATOR

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The LM 78XX monolithic3-terminal positive voltage regulators employ internal current-limiting, thermal shutdown and safe-area compensation, making them essentially indestructible. If adequate heat sinking is provided, they can deliver over 1.0A output cur-rent. They are intended as fixed voltage regulators in a wide range of applications including local (on-card) regulation for elimination of noise and distribution problems associated with single-point regulators. In addition to use as fixed volt-age regulators, these devices can be used with external components to obtain adjustable output voltages and currents.

4. ADVANTAGES

- 1. The main advantage of this project is that it requires **low maintenance.**
- 2. Stabilized platform is easy to handle.
- 3. The substitution of accelerometers provides the additional benefits of less weight and power consumption.

5. APPLICATIONS

Platform stabilization technology can be applied in a wide variety of applications and environments. The ability of our technology to stabilized platform safely, efficiently. Stable platform technology can be used to provide

A. Navigation

Stable platform is used in ships mainly For medical applications & landing of helicopters.

B. Transportation

While transporting delicate things like glass material or heavy things through ships via sea or any other water source, stabilized platform is more useful.

C. Defense ships

Stabilized platform is also used in war at navigation area.

6. EXPERIMENTAL RESULTS

Sr. No.	Platform Position	LED
1	Left	1110
2	Right	1101
3	Front	1011
4	Back	0111
5	Stable	1111

Table no. 1 output of a platform's position.



Fig no. 4. Stable platform

Fig no. 4 shows the experimental setup for stabilized platform



Fig. no 5. For stable platform

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Fig no.5 shows the conditions for stable platform. In which, all four LED's are ON. Here LED's output condition is 1111.



Fig. no. 6 For Unstable platform

Fig no 6 shows the condition for unstable platform. Here any one of the LED indicates the unstable state of platform. If platform tilted to left, the output is 1110, if right, the output is 1101, if front, the output is 1011 if back, the output is 0111.

7. CONCLUSION

Platform Stabilization using accelerometer is successfully implemented. The Platform Stabilization is obtaining in the form of two dimensional manners (X-axis, Y-axis,) from accelerometer.

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