

FINAL YEAR PROJECT REPORT

COMPUTER BASED VISUAL RECON USING

STABILIZED PLATFORM



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Project Report submitted to the
Department of Electrical Engineering, University of Management and
Technology in partial fulfillment of the requirements for the degree of
Bachelor of Science
In
Electrical Engineering

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(09/03/12)

Abstract

This project was designed to recon using a stabilized platform for stable video feed and Reconnaissance. That stability was not achieved by a Gyro or Accelerometer but by means of a simple Potentiometer. Image Processing was also used to provide more stable image and Edge Detection. Remote Manual Control was also provided to operate the camera to any position during the live feed. The platform was mounted on a small toy car (or specially designed electronic car) to be a Recon Device and could be operated from a remote location.

Dedication

This project is dedicated to our parents and especially our teachers, whose combined efforts have made us the educated, civilized people that we are today. We specially thank to Techno Crafts Pvt.

Table of Contents

Abstract		iii
Dedication		iv
List of figures		vi
Chapter 1 Introduction		1
1.1 Introduction	Error! Bookmark not defined.	
1.2 Reconnaissance		1
1.3 Stablized Platform		1
1.4 Introduction to servo motor		2
Chapter 2 Results and discussion		3
2.1 Sensor		3
2.1.1 Pendulum		4
2.2 Servo Moor Control Circuit		5
2.3 Platform Designing		7
2.4 Camera Cotrol Mechanism		11
Chapter 3 Summary and conclusion		15
3.1 Summary		15
3.2 Future Advancements		15
Chapter 4 References		16
4.1 References		16
Chapter 5 Appendices		17
5.1 1 st PIC Microcontroller 16F877A Coding (Servo Control)		17
5.2 2 nd PIC Microcontroller 16F676 Coding (Camera Control)		19

List of figures

Figure 1: Sensor	3
Figure2: Sensor block diagram	4
Figure 3: Design of Servo Motor Control	5
Figure 4: Servo motor control circuit on Vero board	6
Figure 5: Stabilized Platform design #3	7
Figure 7: Stabilized Platform design #1	8
Figure 8: Stabilized Platform design #2	9
Figure 9: Stabilized Platform design #3	10
Figure 10: Stabilized Platform design #3 balancing issue	10
Figure 11: Stabilized Platform design #3 balancing issue solving	11
Figure 12: Design of Camera control Mechanism	12
Figure 13: Servo motor working	12
Figure 14: Servo gear optimization	13
Figure 15: Camera control mechanism	13
Figure 16: Camera control mechanism Block diagram	14

Chapter 1 Introduction

1.1 Introduction

This project is basically a Recon Device to work in remote areas while the user is sitting away. This device can take snap shots and video feed once it is operational. A stabilized platform was also used to mount camera for stable vision which was further maintained by image processing using a computer. Camera could be rolled to any direction where the user desired. Platform was placed on a homemade car using DC Motors and a small 12V 3Amp battery to be used as a vehicle.

1.2 Reconnaissance

Reconnaissance is the military term for exploring beyond the area occupied by friendly forces to gain information about enemy forces or features of the environment.

Examples of reconnaissance include patrolling by troops (rangers, scouts, or military intelligence specialists), ships or submarines, manned/unmanned aircraft, satellites, or by setting up covert observation posts. Espionage normally is not reconnaissance, because reconnaissance is a military force's operating ahead of its main forces; spies are non-combatants operating behind enemy lines.

1.3 Stabilized Platform

It's a unique platform that has the ability to stabilize itself automatically without giving any manual input. One can mount anything on it to have a balanced stability. The platform can stabilize itself two-ways, back-fourth and right-left. The position of the platform is set by using two analog servo motors which can angle the position been instructed by the microcontroller (16F877A) that uses the feedback coming from the pendulum on both axis. The pendulum is basically a potentiometer (Variable-Resistor) that changes the output voltage with a very slight change occurred.

1.4 Introduction to servo motors

A servomotor is a motor which forms part of a servomechanism. The servomotor is paired with some type of encoder to provide position/speed feedback. A stepper motor is one type of servomotor. A stepper motor is actually built to move angular positions based upon each possible step around the entire rotation, and may include micro steps with a resolution such as 256 micro steps per step of the stepper motor. A servomechanism may or may not use a servomotor. For example, a household furnace controlled by a thermostat is a servomechanism, because of the feedback and resulting error signal, yet there is no motor being controlled directly by the servomechanism.

Positioning servomechanisms were first used in military fire-control and marine navigation equipment. Today servomechanisms are used in automatic machine tools, satellite-tracking antennas, RC Airplanes, Automatic Navigation Systems on boats and planes, and aircraft gun control systems. Other examples are fly-by-wire systems in aircraft which use servos to actuate the aircraft's control surfaces, and radio-controlled models which use RC servos for the same purpose. Many autofocus cameras also use a servomechanism to accurately move the lens, and thus adjust the focus. A modern hard disk drive has a magnetic servo system with sub-micrometer positioning accuracy.

The input consists of variable width pulses; counterclockwise motor movement occurs for pulses with width less than a specified value, usually 1.5ms and clockwise movement occurring for the opposite scenario. To provide these pulses to the motor, a microcontroller (PIC 16f877a in our case) with a PWM channel is needed.

The microcontroller sends a series of rectangular pulses (PCM) of controlled widths to the motor, and there the position of the armature of the motor is determined via the duty cycle of those waves .