Remote Video Control System Project Report

Project Number/Contest ID: RF108292

By Kyle Ross
Submitted 1/16/2010
Project Description

The Remote Video Control System will allow a remote user to fully control a separate video camcorder with a control board. The remote user has all the capabilities as if they were using the camcorder in-hand, including pan, tilt, zoom, Record, Display on/off, Tilt Position indicator, 4 speed settings, and even a real-time display through a TV sender and TV tuner/video display.

The user's control interface consists of a development board with one joystick and six buttons to control the remote system. The joystick allows the camcorder system to be controlled with 2 axes: pan (Left/Right) and tilt (Up/Down). The six buttons consist of four buttons to control the camcorder (Record, Display on/off, Zoom In, and Zoom Out) and two buttons for speed settings (Increase Speed and Decrease Speed). The control interface also includes two displays, the Tilt Position Indicator and the Speed Indicator. The Tilt Position Indicator simply consists of 8 in-line LEDs which light up in sequence to specify how far up or down the camcorder is tilted (the more LEDs lit, the farther up the camcorder is tilted). The Speed Indicator involves the 7-segment LED display to reveal the current motor speed for the remote system; “1” indicates the slowest speed setting while “4” is the fastest. I realized when heavily zoomed with the camcorder, a standardized, set speed setting would make the camcorder appear to be panning and tilting faster than it truly were. Therefore by implementing four different speed settings, the user can better control and choose how fast the camcorder will move by making the joystick appear to have several sensitivity settings.

The remote system consists of a tripod equipped with the motorized camcorder mounting bracket, camcorder, system electronics enclosed in a project box, and video sender. After receiving the control signals from the “master” system, the “slave” system does a minimal amount of processing to interpret how to control the various camcorder components. The system decodes any camcorder control for the Infrared (IR) LED, sends the appropriate Panning signals to the motor, sends the appropriate Tilting signals to the motors, then sends appropriate control signals to the IR LED to control the camcorder. The camcorder uses a composite video output port to send the video signal to the video sender, which then sends the signal over the air to be received by the user’s TV tuner/video display. With this implementation, the user can see exactly what the camcorder is doing and recording. Without these components, this system would be as good as a person driving a vehicle with an opaque windshield; the user needs to have feedback from the remote system to determine how to properly control the system.

The following lists the specifications of the Remote Video Control System:

- Pan Left/Right
- Tilt Up/Down
- Zoom In/Out
- Record
- Display On/Off
- Up/Down LED Position Indicator
- 4 Speed Settings with numeric Display
- Video Monitoring
- Completely Wireless
Program Flowcharts & Source Code

Master Overview

Start

Pin Declarations

Constant Declarations

Variable Declarations

Variable Initializations

Transceiver

UD_Position

Convert Joystick (A → D)

Determine Motor Speed

Calculate Left/Right Motor

Calculate Up/Down Motor

Determine Camera Control

Send DATA (to Slave)

Display Up/Down Position

Display Motor Speed
Master Subroutines

Convert Joystick (A → D)

Enable MAX186

Send Left/Right Control Byte

Receive 12-bit Left/Right Data

Send Up/Down Control Byte

Receive 12-bit Up/Down Data

Disable MAX186

RETURN

Determine Motor Speed

No

Increase Speed Pressed?

Yes

Within Boundaries?

Yes

Increase Speed

No

Within Boundaries?

Yes

Increase Speed

No

Decrease Speed

Within Boundaries?

Yes

Increase Speed

No

Decrease Speed

RETURN
Calculate Up/Down Motor Value

Above Maximum Joystick Boundary?

Yes

Below Minimum Joystick Boundary?

Yes

No

Hold Position at 20

Scale within 21 & 40

Scale within 21 & 40

Outside Holding & Within Position Boundaries?

Yes

No

Speed

1

2

3

4

Convert to Slowest Pulse Duration

Convert to Medium Pulse Duration

Convert to Slow Pulse Duration

Convert to Fast Pulse Duration

Within Boundaries & Timeout?

Yes

No

Within Boundaries?

Yes

No

No

Hold Up/Down

Increment Up/Down Timeout: Moving

Hold Up/Down

RETURN

Yes

Hold Up/Down

Retrigger Up/Down Timeout: Moving

Hold Up/Down

Within Boundaries & Timeout: Moving

Timeout: Moving

Within Position Boundaries?
Determine Camera Control

Convert Pushbutton statuses to Numbered “Request” Variable

RETURN

Send DATA

Motor Control or Camera Requests?

No

Send Synchronization Pulse

Send Motor & Camera Control Data

Disable Transceiver

Remove Hold/Moving designation from Up/Down Position

Yes

Enable Transceiver

RETURN
Display Up/Down Position

Switch to Auxiliary I/O

Within Timeouts OR Request?

No

Turn off LEDs

Yes

Determine number of LEDs lit

Convert to LED Outputs

RETURN

Display Motor Speed

Use Speed to determine number displayed on 7-segment LED

Switch to Main I/O

RETURN
Slave Overview

- Start
  - Pin Declarations
  - Constant Declarations
  - Variable Declarations
  - Transceiver Initialization
  - 555 Timer Initialization
  - Reset ServoPAL
  - Center Camera Up/Down
    - Receive DATA (from Master)
      - Determine Camera Control
        - Send Left/Right Motor Pulses
        - Send Up/Down Motor Pulses
          - Control Camera
Slave Subroutines

1. Receive DATA
2. Enable Transceiver
3. Receive Motor & Camera Control Data
4. Disable Transceiver
5. RETURN

Determine Camera Control

1. Convert number to Camera Code
2. RETURN

Send Left/Right Motor Pulses

1. Hold Position?
   - Yes: Kill Servo Pulses
   - No: Pulse ServoPAL
2. RETURN
**Source Code**

Please see Attachment 2 for Source Code in .BS2 format.
# Bill of Materials

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Pictures

Figure 1: Camcorder Mount Sketch

Figure 2: Mounting Brackets Sketch

Figure 3: Cutting Mounting Brackets to length

Figure 4: Cutting Pan Motor hole
Figure 5: Remote User Interface

Figure 6: Camera and Mounting Brackets