Hand Motion Control of an Audio Player

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General Overview

- **Functionality**
  - Record/Playback audio based on given hand motions

- **Inputs**
  - Accelerometer
  - iPod

- **Outputs**
  - Speakers
  - Computer Monitor VGA display
Hand Motions

- Map hand motions to different functionalities of the audio player
  - Play
  - Pause
  - Record
  - Stop
  - Skip forward/back
  - Volume up/down
  - Playback mode (i.e. echo)
Accelerometer

- LIS3LV02DQ
- Features
  - 3-axes
  - Digital output
  - 2g/6g
  - Linear
Interfacing/Interpreting the Accelerometer

- Interfacing
  - I2C

- Interpretation
  - Calibration
  - Motion ROM
  - Motion decoder
Calibration FSM
VGA Display

- Button display
- Mode display
- FSM
  - Based on the command, sets pixel colors of buttons/menu
VGA Display

Paused

STANDARD

ECHO

ALVIN

BARRY
Audio Control

- ac97 chip
  - Input from iPod
  - Output to speakers
- Fast Fourier Transform
- Filtering
- Audio Memory
  - ZBT SRAM
Playback Mode Selection

- Four modes
  - Normal
    - All pass filter
  - Echo
    - Superimpose smaller magnitude time-shifted output on normal output
  - Alvin the Chipmunk
    - Frequency shift up
  - Barry White
    - Frequency shift down
Mode Selection FSM

- **Normal mode**
  - Mode_state = 00
  - Mode_cmd = 0

- **Echo mode**
  - Mode_state = 01
  - Mode_cmd = 0

- **Alvin mode**
  - Mode_state = 10
  - Mode_cmd = 0

- **Barry mode**
  - Mode_state = 11
  - Mode_cmd = 0

- Reset = 1
  - Mode_cmd = 1

- Mode_cmd = 1
Hand Motion Controlled Audio Player Block Diagram