Digital AM Receiver

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6.1.11 Introductory Digital Systems Laboratory
Overall System

- Hassen: Analog Front End & Video Display
- Ebad: User Interface
- Wajahat: Digital Signal Processing

Overall System Block Diagram

AM Transmission (540 kHz-1700 kHz)

Sample[11:0]

buttons, switches

User Interface

Digital Signal Processing

Settings

control

Display

Video Display
Digital AM Receiver System

- Our system receives the entire AM frequency band (530kHz-1700kHz)
- Signal Processing done in the digital domain to demodulate AM signals
- User-programmable and customizable
The Analog Front End will:

1. Receive the AM frequency band by resonating at the center frequency of the AM band and filtering any frequencies above 1700kHz

2. Amplify the received AM transmission

3. Digitize the analog signal to be used by the DSP module

   - 12 bit samples at 3 Msps (caution: Nyquist rate)
Digital Signal Processing

- Sampling
- Down-conversion
- Low-pass filtering
- Decimation
The User Interface

- Users interact with the core of the system through the user interface
- Three main features available:
  1. Select/Play a particular AM channel
  2. Pause/Replay a live transmission
  3. Bookmark favorite channels
Block diagram for the User Interface

- **Memory (for Pause/Replay)**
- **FSM**
- **Table Lookup ROM (for bookmarks)**
- **ROM control (from FSM)**
- **ROM data**
- **output frequency (to DSP)**
- **memory control**
- **memory data**

Inputs (from switches):
- channel select
- pause/replay
- bookmark

Synchronizer
Implementation of Video

System Clock (27MHz)
Sync Generator
Pixel Clock (40MHz)
ROM
Data from UI (Ebad)
Synchronizer
Digital Clock Manager (DCM)
RAM
Reset
Display
Reset_sync
Blank
Vsync
Hsync
FSM
Address[5:0]
WE
CE
Address[9:0]
RGB[23:0]
RGB[23:0]
Implementation of Video

Video Display will:

1. Display AM radio station information (ie. Name, Number, Category)

2. Display a user menu so the user can customize the Digital AM Receiver System

3. Display the frequency content of the channel (Fourier Transform)
Time Line

- Individual Module Implementation
  - April 29
- System Integration
  - May 5
- System Enhancements/Debugging
  - May 8