

Initial Design Review

Mu.S.E.

Musically Stimulating Environment

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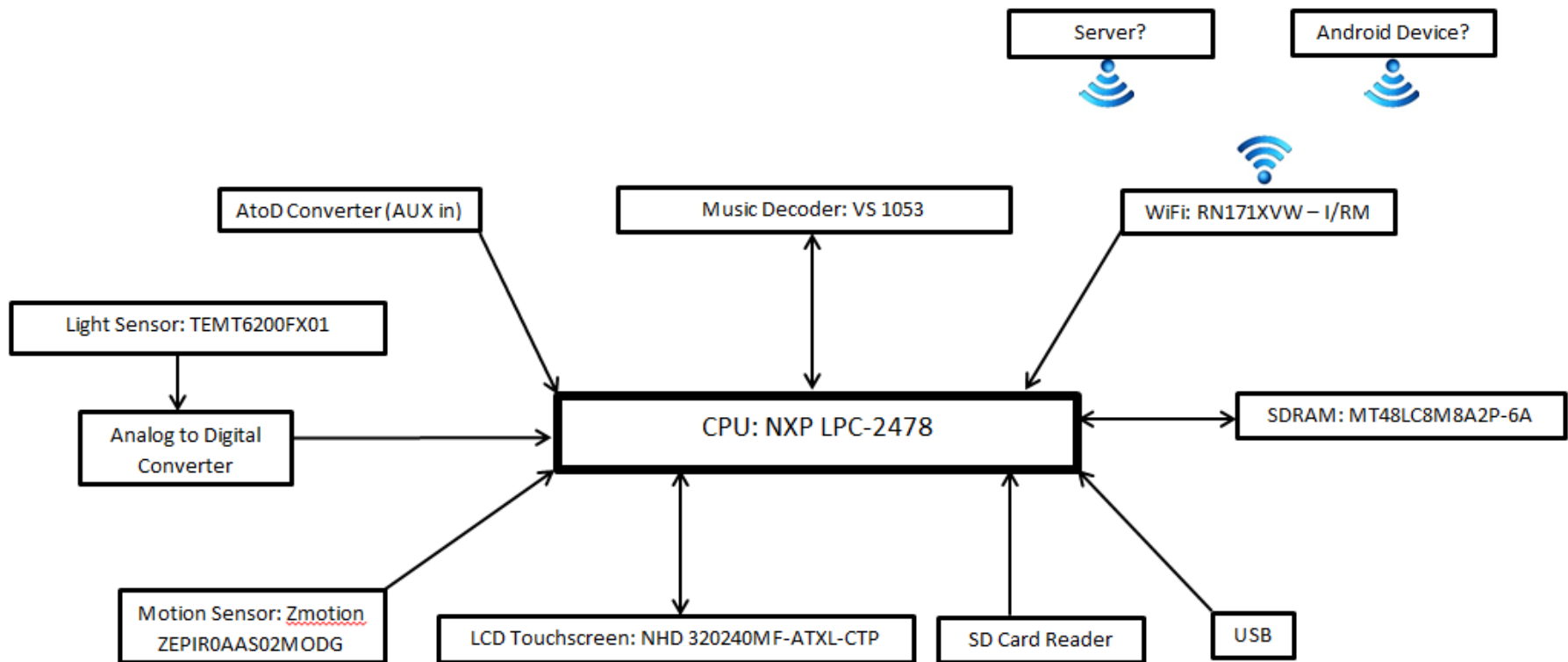
Project Description

- Music player that plays custom songs and playlists based on multiple factors including:
 - Lighting (artificial, natural, brightness)
 - Time of day
 - Weather
- Read from SD Card, Streaming music (Google music, maybe Pandora), Analog in/out
- Motion Detection to start playing when the user enters the room, autosleep due to inactivity (can be disabled)
- Touchscreen functionality with GUI for navigating songs and editing playlists/other information
- Additional Functionality
 - Android device enabled over WiFi (uses app with GUI to communicate)
 - USB connection for basic mp3 device (ideally ipod or android).
 - Integrated speakers

Applications

- Small, discreet, functional, all encompassing music player that has added functionality.
- Plays music automatically to set the tone of the room
- Useful in commercial practice as a consumer product

High Level Block Diagram

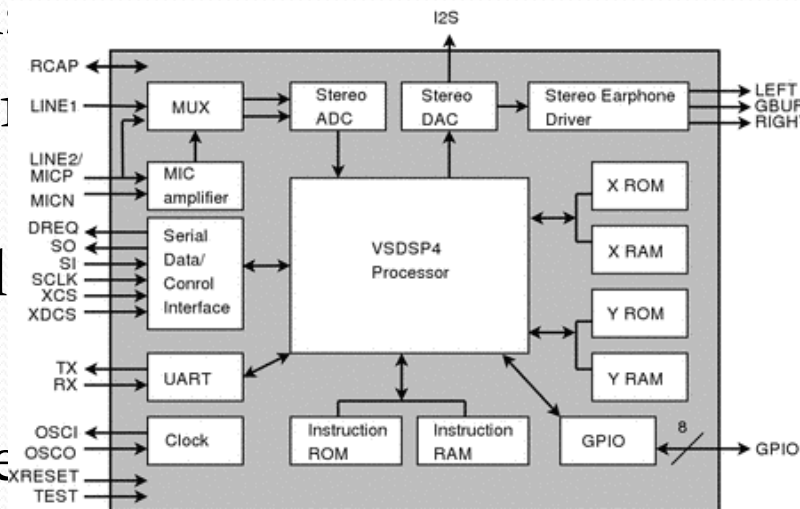


Responsibility

- Tim: Group leader, Software lead, networking, music
- Omar: Touchscreen, SDRAM, co-lead for board design
- Ward: Light/motion sensors, USB/SD, co-lead for board design
- All: Processor

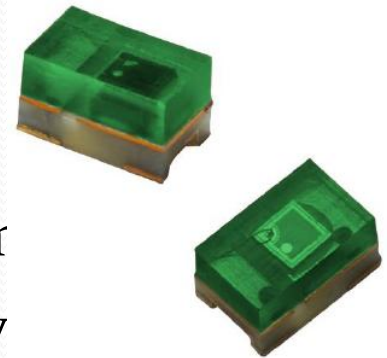
Parts and Specifications

- Music Decoder Chip - VS1053
 - **Ogg Vorbis / MP3 / AAC / WMA / FLAC / MIDI Audio Codec Chip**
 - Bass and treble control
 - Operates with a single clock
 - Internal PLL clock mul
 - Low-power operation
 - Serial control, data interface
 - UART for debugging purposes



Parts and Specifications

- Light Sensor Module - TEMT6200FX01
 - +/-60° field of view
 - Supply voltage: 3.0 to 5.5VDC
 - Dimensions: 16(W) x 12(H) x 4(D)mm
 - Adapted to human eye responsivity
 - High photo sensitivity
 - Silicon NPN epitaxial planar phototransistor in a miniature transparent 0805 package for surface mounting



Parts and Specifications

- LCD Touchscreen – Newhaven Display - NHD-3.5-320240MF-ATXL#-CTP-1
 - 320xRGBx240 resolution
 - LED backlight
 - 24 bit RGB digital RGB interface (6.5MHz)
 - Capacitive Touch Panel with Controller
 - Serial I2C clock and data



Parts and Specifications

- WiFi Module – **RN171XVW-I/RM**
 - 8-Mbit flash memory and 128-Kbyte RAM, 2-Kbyte ROM, 2 Kbyte battery-backed memory
 - UART (1 Mbps host data rate) and SPI slave (2 Mbps host data rate) hardware interfaces
 - Real-time clock for wakeup and time stamping/data logging; auto-sleep and auto-wakeup modes
- Network support:
 - Supports ad hoc and infrastructure mode connections
 - Push-button WPS mode for easy network configuration
 - On-board TCP/IP stack
 - Over the air firmware upgrade (FTP) and data file upload support
 - Secure Wi-Fi authentication via WEP-128, WPA-PSK (TKIP), and WPA2-PSK (AES)
 - Configuration over UART or wireless interfaces using simple ASCII commands
 - Built in networking applications: DHCP client, DNS client, ARP, ICMP ping, FTP client, TELNET, HTTP, UDP, and TCP



Parts and Specifications

- SDRAM - **MT48LC8M8A2P-6A**
 - PC100- and PC133-compliant
 - Fully synchronous; all signals registered on positive edge of system clock
 - Internal, pipelined operation; column address can be changed every clock cycle
 - Single $3.3V \pm 0.3V$ power supply
 - Clock Rate 166 MHz

Parts and Specifications

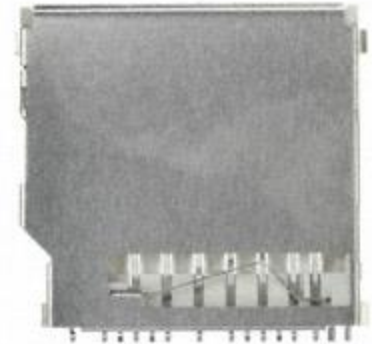
- Motion Sensor – Zmotion ZEPiRoAASo2MODG
 - Small form factor – only 25.5 mm x 16.7 mm x 9.5 mm
 - 8-pin interface connector with two available orientations (right-angle and straight)
 - Wide 5m x 6m, 60-degree detection pattern
 - Simple hardware- or advanced serial (UART)-based configuration and interface
 - Adjustable sensitivity and output activation time and support for Ambient Light Sensor input
 - Unique Hyper Sense feature automatically increases sensitivity after motion is detected
 - SLEEP Mode for low-power applications
 - Minimal components ensure high reliability (no electrolytic capacitors)
 - Modify the application code to suite your own application requirements
 - 2.7V to 3.6V operation from 0°C to 70°C

Parts and Specifications

- SD Card Connector

PIN ASSIGNMENT

NO.	SIGNALS FUNCTION	SD/MMC4.0
#1	WP SW	SD
#2	CD SW	SD
#3	DAT1 (Data 1)	SD-8
#4	DAT0 (Data 0)	SD-7
#5	DAT7 (Data 7)	MMC-13
#6	GND/VSS 2	SD-6
#7	DAT6 (Data 6)	MMC-12
#8	CLK	SD-5
#9	VCC/VDD	SD-4
#10	VSS 1	SD-3
#11	DAT5(Data 5)	MMC-11
#12	CMD	SD-2
#13	DAT4(Data 4)	MMC-10
#14	DAT3(Data 3)	SD-1
#15	DAT2(Data 2)	SD-9



- USB Connector



Technology and IP Reuse

- LPC-2478 ARM7 CPU
- Roving Networks WiFi module
- Newhaven Touchscreen module
- Motion Sensor
- Light Sensor

Critical Design Elements

- Music Player
 - If the music functionality doesn't work then we essentially have a big paperweight with a nice screen
- Light sensor
 - Necessary to choose specific songs/playlists
- Touchscreen with GUI
 - Necessary to interact with the device and change songs/settings
- At least one form of non-volatile storage
 - Need to be able to actually read music from storage, primarily looking at SD card. USB and WiFi are less essential

Milestone	Date	Task	Start Date	End Date	Person Responsible
		Form Group	10/1/2012	10/5/2012	All
		Formulate Idea	10/1/2012	10/8/2012	All
		Make block diagram	10/1/2012	10/8/2012	All
		Conceptual Drawing	10/1/2012	10/8/2012	All
Milestone #1	10/8/2012				
		Research: WiFi, Light Sensor	10/8/2012	10/11/2012	Tim
		Research: Motion Sensor	10/8/2012	10/11/2012	Omar
		Research: Touchscreen	10/8/2012	10/11/2012	Ward
		Compile Milestone #2	10/10/2012	10/14/2012	All
Milestone #2	10/15/2012				
		Create IDR Package	10/16/2012	10/24/2012	All
Initial Design Review	10/24/2012				
		Gather Bill of Materials	10/24/2012	10/29/2012	All
		Gather all final datasheets	10/24/2012	10/29/2012	All
		Very detailed block diagram	10/26/2012	10/31/2012	All
		Figure out software, compilers, networking system	10/24/2012	10/31/2012	Tim
		Figure out how to get data from sensors and USB/SD card	10/24/2012	10/31/2012	Ward
		Figure out SDRAM, how to use touchscreen	10/24/2012	10/31/2012	Omar
		Start board design	10/26/2012	10/31/2012	Omar and Ward
		Compile Milestone #3	10/29/2012	10/31/2012	All
Milestone #3	10/31/2012				
Perliminary Design Review	11/5/2012				
Milestone #4	11/28/2012				
Critical Design Review	12/3/2012				
Milestone #5	12/7/2012				

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- Questions?
 - Comments?
 - Concerns?