Virtual Pet

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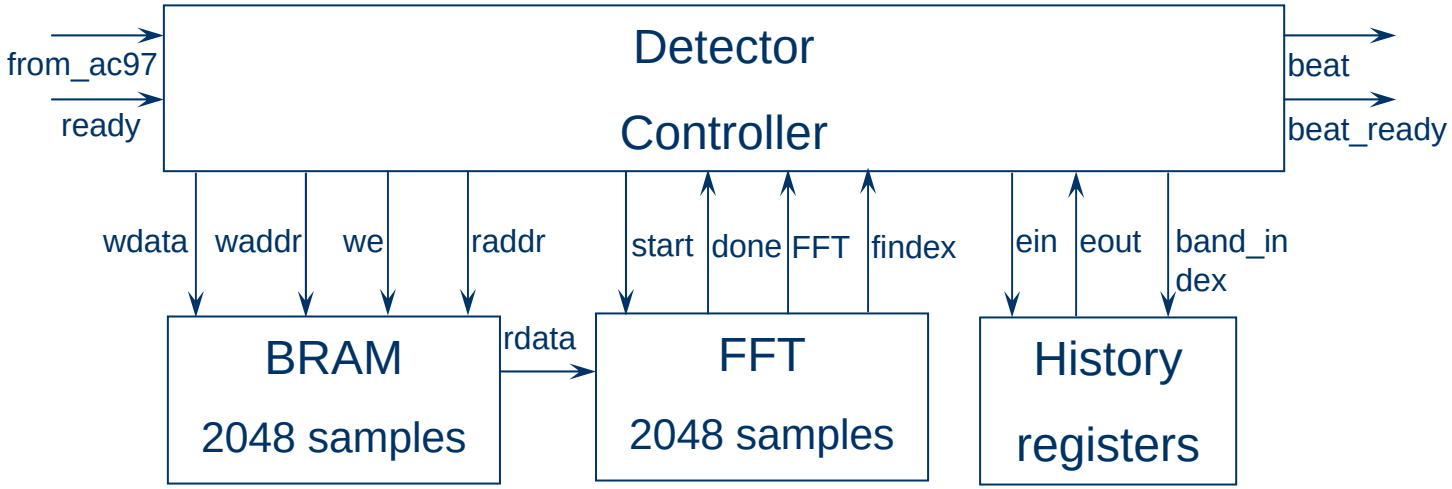
Overview

- A virtual pet that lives inside the LCD display.
- It listens to music and dances to it.
- When it dances, the lights in the LCD display flash according to the music beat.
- When it is idle, the lights express its emotion.
- Music makes it stay happy and alive.
- 2 main components:-beat detector and video.

Beat detection

- A beat is a variation in the strength of audio signal.
- Feed 2048 samples (at frequency 48khz) into FFT.
- Break the frequency range into 32 subbands, and calculate the energy of the subbands.
- Compare the energy of the subbands to the average energy of the subband in past one second.
- If Current Energy > c*Average Energy in past one second, a beat is detected.

Beat Detector Block Diagram



Video Modules

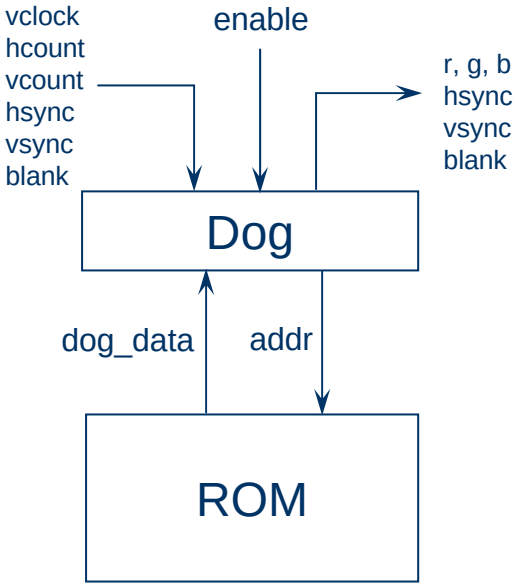
- 4 video modules of fixed pixel locations
  - Dancing dog
  - Idle dog
  - Health Meter
  - Lights
- Main FSM controls the video modules.

Main FSM

- Initial state is idle—Lights show emotion, Idle dog video module is active.
- When a beat is detected, FSM changes to dancing state—Lights flash according to music beat, Dancing dog video module is active.
- Determine the health and emotion of the pet, based on the amount of music played and when music was last played.
- If there is no beat after a certain amount of time, Main FSM switches back to Idle state.

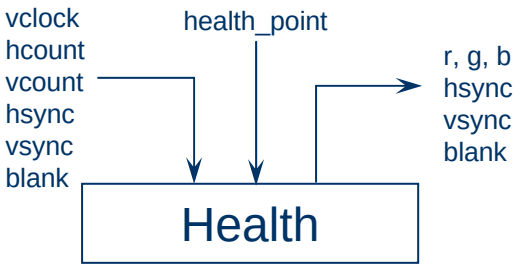
Dog Modules (Idle and Dancing)

- Retrieve video data from ROM when activated.
- ROM is 24-bit wide to store the values of 3 colors at each pixel.
- Address to ROM increases everytime vcount increases.



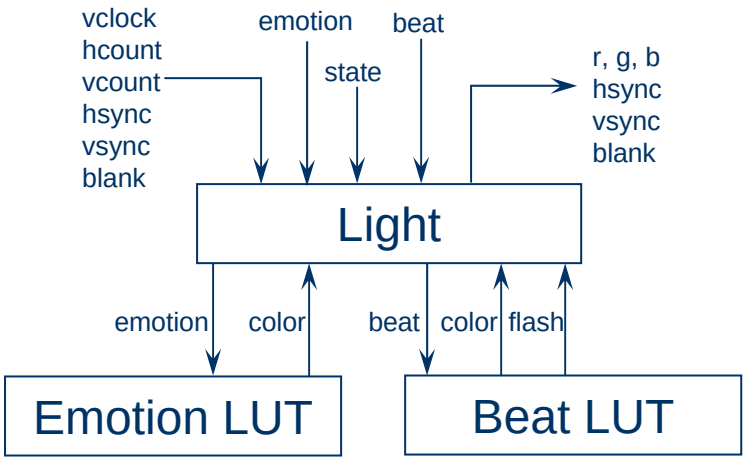
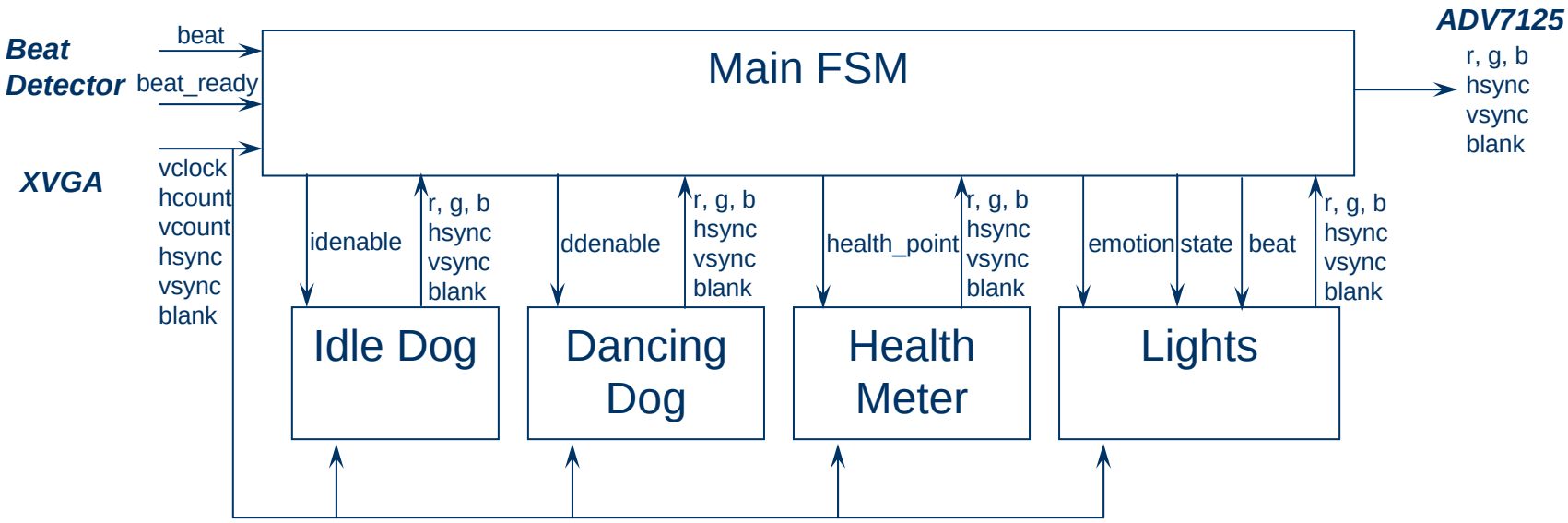
Health Meter

- Health Point determines the color and the length of health meter.
- Health meter video module draws the health meter based on the health point from Main FSM.



Lights

- In Idle state, emotion determines the color of the lights.
- In Dancing state, beat determines the color of the lights and whether the they flash.



Higher Level Video Block Diagram