

# EEL 4924 Electrical Engineering Design (Senior Design)

## Project Abstract with Diagram(s)

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(Thanks to ..., I don't remember, but someone designed a pong robot previously)

### Project Title: **Thingamajig**

#### **Team Members:**

Name: **Joe Blow**

Name: **Clem Kadiddlehopper**

#### **Project Abstract:**

Our project consists of building a beer pong table that will play a game of beer pong between two robots. The table will have a robot on each end. Each robot will calculate the future path of the ball to catch any balls that do not end up in a cup. Each robot will also attempt to throw a ball in a cup. The robot will use a camcorder to film the motion of the ball and will do the image processing on an FPGA. After calculating the x and y coordinates the FPGA will send this information to a microprocessor. The microprocessor will calculate the speed of the ball the angle of motion and thus the future position of the ball. The microprocessor will also control a stepper motor which guides the pong robot left and right. Once the pong robot has tracked down the ball catch it and shoot it with a pinball-like device..

## **Abstract: Thingers**

### **Introduction:**

The Thingamajig project finds application in the domains of robotic vision image processing and position control. The robot has to recognize a specific object calculate its future path, capture the object and launch it towards a specific location.

The purpose of the project is to design an entertaining beer pong machine. The game of beer pong is commonly played by two or more players, however this machine will allow the humans to sit on the couch and pay the penalty for the robots actions. The game will be fun and entertaining and can be played at all times without having to get up off of the couch. If time permits, a human(s) will be trained to take the place of one or both of the robots. The pong robot will **NOT** be expected to drink, but may behave more erratically as the game progresses.

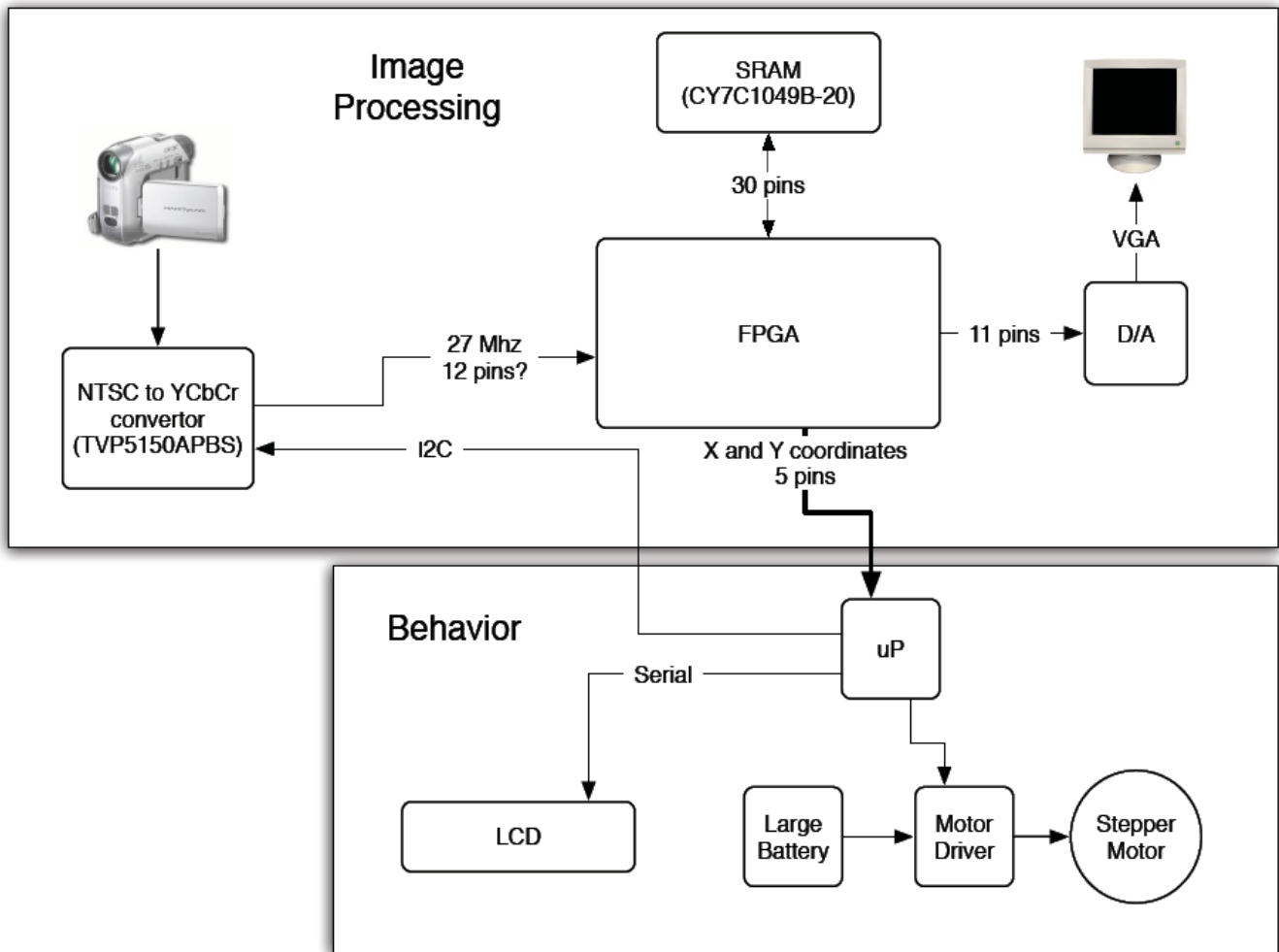
### **Technical Objectives:**

The main objective of our project is to design a system that can track a very fast moving object.

- The first problem that has to be resolved is interfacing a camcorder to an FPGA. The camcorder outputs a signal in NTSC format but we have found a chip that can convert NTSC signals to Y Cr Cb/ RGB signals. The Y Cr Cb signal is a digital signal that can be easily converted to an RGB signal. The FPGA will be able to read the RGB signal and store it in ram pixel by pixel.
- The FPGA will complete a part of the image processing by finding the x and y coordinated of the ball and transmitting them to the microprocessor. The ball will be painted white and the surface of the pong table will be black. The ball will be easily distinguished since the pixels where the ball is located should have different digital values.
- The microprocessor will receive multiple (x,y) coordinates within a time period and will find the future position of the ball with the aid of an algorithm. The algorithm will take into account the fact that the ball can bounce off the walls of the pong table and change trajectory after contact.
- The microprocessor will control the position of the pong robot with the aid of a stepper motor. The stepper motor can reference its position to the center of the pong table.
- The microprocessor will also control a paddle with which the pong robot hits the ball. The paddle will continually spin when the ball is in its proximity so that it does not have to calculate the precise moment of contact with the ball. The figure bellow shows a diagram of the components integrated into the system.

This is a preliminary estimation of how the components will connected and function together.

## Abstract: Thingers



### Cost Objectives:

We expect the price of our Thingamajig to be under \$437, not including the price of the computer connected wirelessly. A partial list of the part prices will be given in the Preliminary Design Report. There are no similar devices available on the market with which to compare the costs.

### References or Bibliograph:

<http://mil.ufl.edu/5666/>

### Materials and Resources:

We need a good video camera and plan to use an Altera FPGA (probably a Cylone II). We will probably use an Atmel XMEGA microcontroller.