Title: Pong Bot

Team Name: The Pongers

Submitted by:

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Project abstract:

Our project consists of building a pong table that will play a game of pong with a human. The table will have a robot on one end and the other end is left open for a human player. The robot will calculate the future path of the ball, will approximate the position where the ball will reach its end of the table and will hit the ball back to the human on the other side. 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 it will hit the ball back with the aid of a spinning paddle.
**Introduction:**

The Pong Bot 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 and hit the object back. The purpose of the project is to design an entertaining pong machine capable of playing pong with a human. The game of pong is commonly played by two players however this machine will give the possibility of just one player to have fun playing the game. The game will be fun and entertaining and can be played at all times without having to find a partner. If time permits two pong robots will be constructed on each end of the table and will play the game with each other.

**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 CrCb/ RGB signals. The Y CrCb 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 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 below shows a diagram of the components integrated into the system. This is a preliminary estimation of how the components will connected and function together.