

## Virtual Softball Project Checklist

### First Base

1. Calculate angle of a physical bat swing using an IMU's accelerometer readings. Also determine timing of swing from gyroscopic readings.
2. Connect FPGA to IMU via a microcontroller transmitting a stream of accelerometer data using UART over a direct wired connection. Deserialize this input to get real-time values.
3. Graphically represent an approaching ball by blending color and increasing size of a circle.
4. Display a bat object at any angle provided by a real bat orientation.
5. Signal a new pitch and calibration with a button press. Trigger graphical response based on swing timing.

### Second Base

1. Randomly change the ball location in the strike zone between pitches. Correctly detect a hit or miss taking into account the ball's location and bat swing.
2. Detect that the user wants the next pitch when they raise the bat by their shoulder. Graphically pitch the ball at this time.
3. Based on the bat angle and timing, show on the ball where the bat would have likely contacted the ball.
4. Determine the angle of the physical bat as it comes through the strike zone using a combination of accelerometer and gyroscope readings. The purpose of this is to more accurately determine the bat angle at high speed circular swinging motions.

## Third Base

1. Transmit IMU data over bluetooth connection to wirelessly communicate with the FPGA.
2. Improved gameplay interface in at least two of the following areas.
  - Include softball-themed backdrop on screen.
  - Add sound effects for ball hits and misses.
  - Make game playable on TV screen
  - Adjustable difficulty can be set by the user before each swing.
  - Provide scoring system
3. Utilize an addressable RGB LED strip to indicate the approaching ball, which is appropriately in sync with the FPGA.

## Home run

1. Have fun!