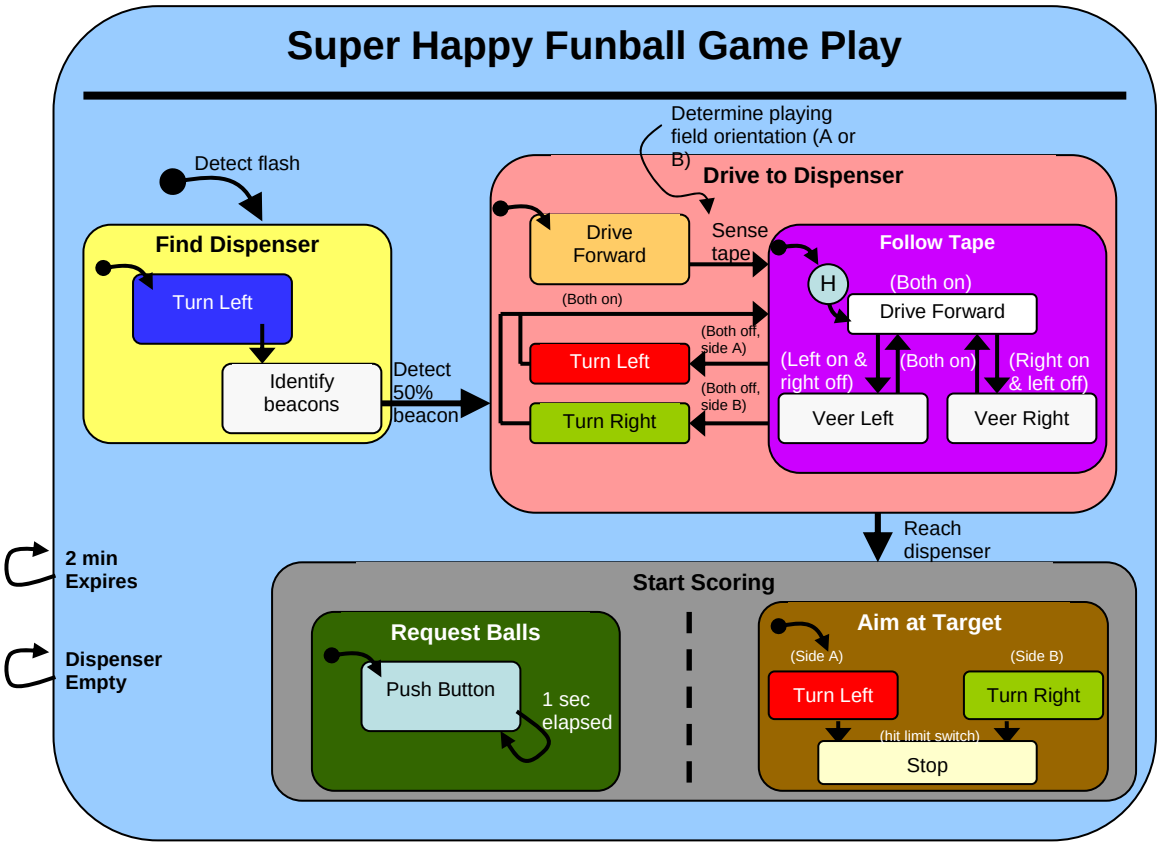
Software Design “State of the Union”

John Alabi, Kent Anderson, Vickie Chiang, Matthew Hill

Top Level State Diagram



Device Driver Level Modules

Beacon Detector Module for both Navigation & Aiming

- InitializeBeaconDetector – Returns nothing, takes nothing. Initializes all necessary hardware and variables for the beacon detector.
- CheckBeaconOnStatus – Returns an unsigned character corresponding to the current beacon detector state. The first two bits correspond to
  - ALL_OFF 0x00
  - RIGHT_ON 0x01
  - LEFT_ON 0x02
  - BOTH_ON 0x03
- CheckBeaconSeenStatus – Returns an unsigned character corresponding to which, if any, beacon is seen.
  - NO_BEACONS
  - GOAL1
  - GOAL2
  - GOAL3
  - DISPENSER

AimingMotor Module

- InitializeAimingMotor – Returns nothing, takes nothing. Initializes subsystem.
- AIM_TurnRight – takes an unsigned char speed and turns the aimer right
- AIM_TurnLeft – takes an unsigned char speed and turns the aimer left
- AIM_Stop – takes nothing, returns nothing

DriveMotor Module

- InitializeDriveMotor – Returns nothing, takes nothing. Initializes subsystem.
- SetLeftPWM – takes a signed char DutyCycle and sets that duty cycle for the right drive motor
- SetRightPWM – takes a signed char DutyCycle and sets that duty cycle for the right drive motor

Timer Module

- InitializeTimerModule – initializes a timer at the start of the run that increments with ms precision in a big-endian structure
- GetCurrentTime – Takes nothing, returns the current timer count as a long

TapeSensor Module

- InitializeTapeSensors – takes nothing, returns nothing, initializes sensors
- TSStatus – takes nothing, returns an unsigned char code corresponding to which sensors are active. Example of use:
  `if(TS_LEFT_ON & TSStatus())`
  - TS_CENTER bit 2 hi/lo
  - TS_LEFT bit 0 hi/lo
  - TS_RIGHT bit 1 hi/lo

Higher Level Modules

Aiming Module

- InitAiming – takes nothing, initializes: turret motor, limit switches, tape measure motor
- CheckAimEvents – returns a code corresponding to an event and runs the event checker for the tape measure
    - L_LIMIT Detected rising edge on left limit switch
    - R_LIMIT Detected rising edge on right limit switch
    - NO_EVENT nothing happened

HandleAimEvent

Mode:	Hold Left	Hold Right	Turn Left	Turn Rght	Hold
L_LIMIT	OK, very low duty cycle	Turn left, very low duty cycle	Start Hold	Turn right	Nothing
R_LIMIT	Turn left	OK	Turn left	Start Hold	Nothing
NO_EVENT	Turn left	Turn right	Turn left	Turn Right	Nothing

*EXTEND and retract maintain the hold command and revert to holding when the action is done.

SetAimMode
Disabled during EXTEND/RETRACT

- TURN_RIGHT
- TURN_LEFT
- HOLD_RIGHT
- HOLD_LEFT
- HOLD
- EXTEND – only if holding, reverts to whatever hold it was doing at the time it was initialized. SetMode is disabled here
- RETRACT – only if holding SetMode is disabled here

GetAimMode

Tape Measure Module
CheckTMEvents –

- MARK_DETECTED
- NO_EVENT

HandleTMEvent – handles events from CheckTM Events

Mode:	Hold	Extended	Retracted
MARK	Nothing	Stop/Hold if t>tmin	Stop/Hold if t>tmin
NO_EVENT	Nothing	Nothing	Nothing

SetTMMode – sets the tape measure mode to one of the following modes. Note that the modes EXTENDED and RETRACTED should not be permitted to be set external to the module

- EXTENDED
- RETRACTED
- HOLD

GetTMMode – returns the current tape measure mode.

Old Aiming Module – superseded by new version

- ~~InitializingAim – takes nothing, returns nothing, initializes subsystem~~
- ~~CheckAimEvents – returns a code corresponding to events that may have happened~~
  - ~~BCN_GOAL1{ _L, _R, _B } Sees goal 1 on Left, Right, Both~~
  - ~~BCN_GOAL2{ _L, _R, _B } Sees goal 2 on Left, Right, Both~~
  - ~~BCN_GOAL3{ _L, _R, _B } Sees goal 3 on Left, Right, Both~~
  - ~~DISP_BEACON Sees dispenser → ERROR~~
  - ~~L_LIMIT Hit left limit switch~~
  - ~~R_LIMIT Hit right limit switch~~
  - ~~EXTENDED Deploy Secret Weapon #1~~
  - ~~RETRACTED Un-deploy Secret Weapon #1~~
  - ~~NO_EVENT Boring!~~
- ~~HandleAimEvent – responds to the code from CheckAimingEvents()~~
- ~~Aim_SetMode – takes a code corresponding to which beacon to look for, returns nothing~~
  - ~~DISPENSER~~
  - ~~GOAL1~~
  - ~~GOAL2~~
  - ~~GOAL3~~
  - ~~EXTENDING~~
  - ~~RETRACTING~~
  - ~~SHUTDOWN~~
- ~~IsAimed – Takes nothing, returns TRUE if the aiming subsystem is aiming at the target, FALSE if not.~~

BeaconNavigating Module

- CheckBNEvents – returns a code corresponding to events that may have happened
  - TRGT_LEFT Target is to left of current heading
  - TRGT_RIGHT Target is to right of current heading
  - TRGT_LOCK Both Detectors register, heading OK
  - TRGT_LOST Target is not visible
  - GOAL1 Sees Goal 1, which is not target
  - GOAL2 Sees Goal 2, which is not target
  - GOAL3 Sees Goal 3, which is not target

    - DISPENSER Sees Dispenser, which is not target
- HandleBNEvents – takes event code, responds according to mode
- BN_Mode
    - GOAL1 Goal 1 is your target
    - GOAL2 Goal 2 is your target
    - GOAL3 Goal 3 is your target
    - DISPENSER Dispenser is your target
    - SHUTDOWN

Driving Module

- VeerRight – Takes uchar speed. Initiates a right pivot about the left wheel.
- VeerLeft – Takes uchar speed. Initiates a right pivot about the left wheel.
- TurnRight – Takes uchar speed. Turn left in place
- TurnLeft – Takes uchar speed. Turn left in place
- Forward - Takes uchar speed. Go straight forward
- Reverse - Takes uchar speed. Go straight back
- Stop – takes nothing, returns nothing, stop all drive motors.

LineFollowing Module

- CheckLFEvents – returns a code corresponding to events that may have happened
    - LEFT_ON
    - RIGHT_ON
    - CENTER_ON
    - FRONT_ON
    - ALL_ON
    - ALL_OFF
- HandleLFEvent – handles the line following event according to the current operating mode
- LF_SetMode – Takes a code corresponding to a mode for line following that determines how the event handler responds
    - TURN_RIGHT
    - TURN_LEFT
    - FOLLOW
    - SEEK_LINE
    - SHUTDOWN

BallRequest Module

- InitializeBR – Returns nothing, takes nothing. Initializes all necessary hardware/variables for the ball requesting functionality
- CheckBREvents – returns a code corresponding to different events
    - BR_READY Ready for a new request
    - BR_PENDING Request is pending (1 s between requests
    -
- HandleBREvents – handles event codes
- BR_SetMode – Sets the BR mode. Modes include

    - SINGLE_BALL Request a single ball, resets itself in handler
    - SHUTDOWN Don't Do anything
    - MAX_BALLS Request as many as you can, ASAP
    - MED_BALLS Request continuously at a slower clip
- HowManyBRMade – returns how many ball requests have been made
- Static RequestBall – Returns unsigned character NumberofBalls that tracks the number of balls, including the current ball, that have been requested. It initiates the requesting of a ball.
- Static IsRequestFinished()– continually call this from your event checker after RequestBall. Returns TRUE if done, FALSE if not.
- Static ButtonReady() – Returns TRUE if the conditions are met for requesting a new ball from the dispenser. Based on timer count and history of requested balls.
- Example implementation for max-speed ball requesting

```
while(TRUE)
   if(PendingBallRequest == FALSE) {
      if(ButtonReady())  {
         RequestBall();
         PendingBallRequest = TRUE;
      }
   } else {
      if (IsRequestFinished()) {
         PendingBallRequest = FALSE;
      }
   }
}
```