EmbItion

THE EMDEDDED DARTS IMPLEMENTATION

Embedding the Darts. Bull's-eyes have always been the vent of most of our frustrations. This event wishes to save all those walls, trees and doors from the dents (if not decrease your agitation).
This competition lays the perfect battleground for impassioned minds. So prove your calibre in the thrilling platform of Embition.

PROBLEM STATEMENT

The objective is to design the **classic darts game** in which a dart shall be thrown at a dartboard having three concentric circles.
The game has to be implemented using a **128*64 GLCD** screen, an **AVR/Arduino**, an **ADXL345/Digital Accelerometer** and **Buttons**.
The dart shall be projected from a horizontal line (line of projection) at the bottom of the screen
Basic **feature of resetting** the game with a button press must be present.

INSTRUCTIONS

Visualize a dartboard hanging on a vertical wall. A dart is projected from a horizontal line at a distance R from the board with a velocity of **v units** and angle of projection **theta** with respect to the ground.
A scale is set where each pixel on the dartboard depicts 1cm, i.e. 1pixel = 1cm
Gravity, $g = 10$ m/s^2, acts on the projected dart at all instants of time. And the dart follows the basic motion of a projectile under effects of gravity. The point where the dart hits should be marked on the board. (refer to the figure below)
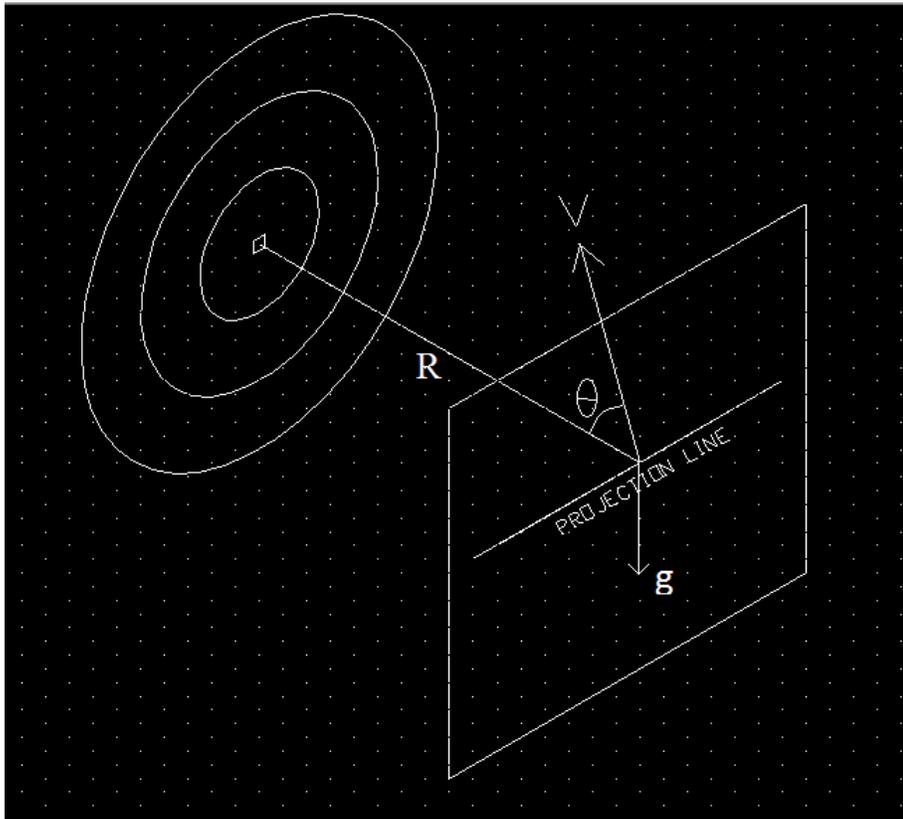
Given below is the layout of the GLCD screen. Each grid in the diagram denotes one pixel on the screen.

Each pixel is 0.52mmx0.52mm.

The centre of all the rings is 32, 32. The coordinate system as for a standard GLCD screen from the left top increasing from 0 to 127 in x direction(right to left) and 0 to 63 in -y direction(top to bottom)

The dimensions of the rings are as follows:
1. **Bull's eye**: A of radius 2 pixels
2. **Ring 1**: A circle of radius 10 pixels
3. **Ring 2**: A circle of radius 20 pixels
4. **Ring 3**: A circle of radius 30 pixels

A scale is set, according to which 1 pixel = 1cm.
Distance of bull's-eye from the Projection line, R = 2m and radius of outermost ring is 30 cm.

The line at the bottom of the screen is the **Projection line**. The projection line is 1 pixel above the lower edge of the GLCD screen. After every shot, the arrow has to come back to the leftmost point on Projection line.

The two boxes above the projection line are **Velocity** and **Angle** meters. The size of these boxes and their position can be decided as per convenience.

The only condition is that the point of the arrow must be 1 pixel. Scoring will be done on the basis of the location of this point of the dart. The shape and size of the dart is up to your choice. For example, the dart can be depicted as a cross with the arrow point as the cross's centre or a triangle with the point as its top.

The accelerometer should be used as follows:

1. Using one of the axes of the accelerometer (e.g X-axis), position your arrow on the projection line.(i.e. you will use the value of this axis to fix the cursor's position).
2. Press a button/switch to fix this position. You cannot change the position of the arrow anymore.
3. Now, use any 2 axes of the accelerometer (say, Y and Z axes) to set the Velocity and Angle meters. One axis' value decides the Velocity and the other decides the Angle of Projection. Both these meters have to be filled (and values from the 2axes have to be read) simultaneously.
4. Press a button/switch again to fix these values (Velocity and Angle) and fire the arrow.

Remember that the dart should follow the motion of a projectile.

Point of impact on the plane of the dartboard should be updated on the Serial Monitor (Windows) or GTK terminal (Linux) after every shot.

In the images below, the front views of both the planes are depicted. The line in the centre separates the 2 planes.
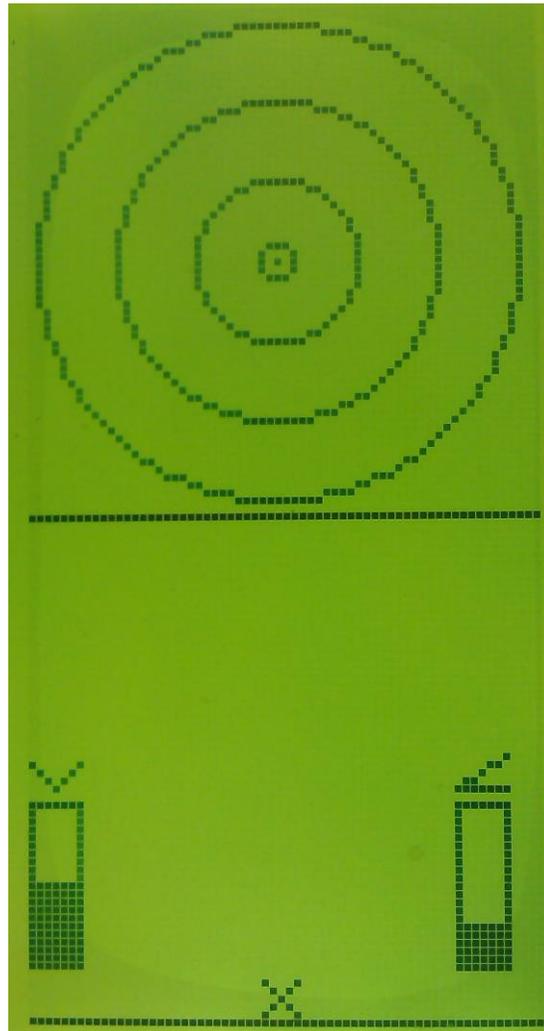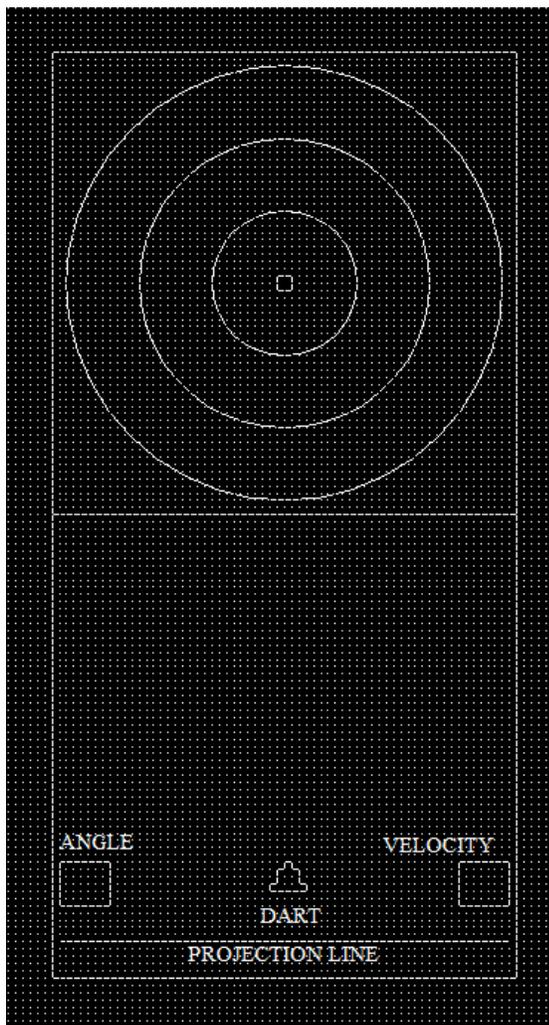
STAGES

Qualifier:
All the teams **must design the dartboard, as given by the organizers**. Teams which have successfully implemented the design shall qualify for further rounds.

Round 1: Time Kill
Score as many points as possible within the given amount of time.

Round 2: Captain's Order s
A ring number shall be given by the event manager to hit each time. Score according to proximity of the dart to the required ring.

Final Round: Knockout Tournament
1. 1-v-1 rounds. 8 strikes on your own systems. Team with higher score wins and moves on.
2. In case of a draw, a Time Challenge (similar to round 2) will be carried out.
3. Losing team will be knocked out of the tournament.

ELIGIBILITY AND TEAM STRUCTURE

• Students **enrolled in any undergraduate/postgraduate program** in the same recognized
institute are allowed.
• Team strength **should not exceed 4.**

GENERAL RULES
• All features have to be executed using the allowed electronic inventory.
• The **software written should be original** and not copied from any other source.
• The participating team **MUST necessarily register** themselves on the event website.
• Abstract submission should be done **by the Team leader from the id he has registered** on the Quark website.
• Failure to implement the above requirements would make your design ineligible for the
competition.
• The teams **must mail the working proof** (photo, video, code sample) if and when asked for prior to the actual
event
• The teams must adhere to the spirit of healthy competition. The teams must not damage their fellow participants'
circuit in any way. Judges reserve the right to disqualify any team indulged in misbehaviour.
• Judges decision shall be final and binding on all.
• The organizers reserve the rights to change any or all of the above rules as they deem
fit. Change in rules, if any will be notified to the registered participants.

JUDGING CRITERIA
- Basic compulsory features.
- The effectiveness of the hardware and software used in solving the problem statement.
- Length of software code.
- Neatness of circuit and game design.

Addition of extra features is greatly encouraged. They will have a significant share in the judging criteria but will be evaluated only after the compulsory tasks are completely executed.

Note: Last date for abstract submission is 5th January 2014

ENJOY DESIGNING!!!