Technical specification for the game "Pinball"

About Pinball

Pinball is a video game developed for MS-DOS compatible operating systems by James Schmaltz in 1993. The basic idea of the game is the same as in the prototype Flicker made by Bally in 1974 using a microprocessor. The goal of the game is to keep the ball on the playing field with obstacles as long as possible. The game was programmed fully in x86 assembly language for MS-DOS systems. It was re-released with support for Microsoft Windows, macOS and Linux in 2017.
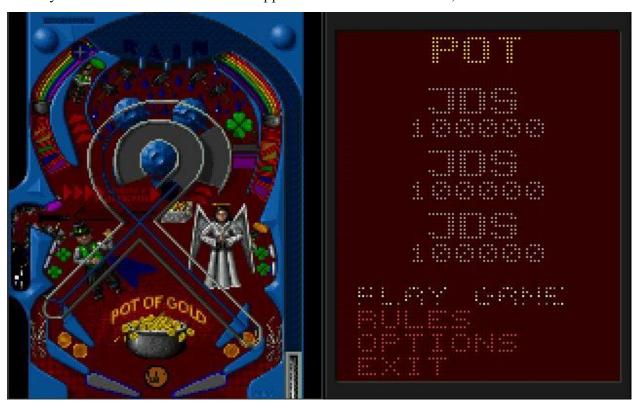

Figure 1 – appearance of the original Pinball game

Rules

The main components of pinball are the playing field with obstacles (walls), the ball and the flippers (doors). There are only 4 types of walls: horizontal, vertical and 2 types of diagonal at an angle of 45 degrees. It is assumed that the playing field has a slight slope, so the force of gravity acts on the ball during the game, which is why it moves from top to bottom.

Before starting the game, you need to press the "LOAD GAME" button, then the "reset ball" button to launch the ball onto the playing field. Wait until the ball approaches the doors at the bottom of the field, then control the doors using the "left" and "right" buttons.

The game has 2 flippers to control the ball. They are located at the bottom of the playing field, directly above the area of the ball loss. The doors perform 2 functions. Firstly, they do not allow the ball to fall into an area that is unacceptable for the game. Secondly, the player uses them to hit the ball towards the walls. The player is awarded points for colliding with walls. The flippers are controlled by two buttons that are located under the game area. The "left" button controls the left door, and the "right" button controls the right one.

The game continues as long as the ball is on the playing field. One point is awarded for each collision with the wall. You need to score as many points as possible. If the ball falls into an unacceptable area, then the game ends (the player ceases to earn points).

Implementation

For the successful implementation of the game on digital logic circuits using the CdM-8 processor, it would be a good idea to divide the process into small and understandable fragments.

Thus, it is necessary to implement at least the following entities and their methods:

1. Player:
   a. Player properties:
      i. door_left – current status of the door (on/off)
      ii. door_right – current status of the door (on/off)
   b. Player methods:
      i. door control – non-simultaneous switching on and off of doors to change the direction of the ball movement
2. Ball:
   a. Ball properties
      i. ball_x – current position of the ball on the X-axis
      ii. ball_y – current position of the ball on the Y-axis
      iii. speed_x – current speed of the ball on the X-axis
      iv. speed_y – current speed of the ball on the Y-axis
   b. Ball methods
      i. calculate the ball – calculates ball's position
      ii. identify a collision – determine the presence of a collision of the ball with the wall
      iii. redirect the ball – change the direction of the ball when it collides with an obstacle

You also need to implement the playing field, walls and the movement of the ball under the influence of gravity.

The implementation should contain a clear and user-friendly interface (display and buttons to control the game). We use a display with a resolution of 64x64 pixels to make the game look beautiful.

The entities of the Pinball game have their own special behavior, which must also be implemented:

1. The player can change the state of only 1 door at a time;
2. The player cannot leave the field;
3. The ball appears at the top of the field;
4. The ball cannot cross the wall;
5. The ball can move in all directions;
6. The score counter should increase by one when the ball hits the wall;
7. The score counter should reset to zero when the ball is reloaded.