Programmier-Projekt

Das Programmier-Projekt

In den folgenden Wochen werdet ihr - erneut - an einem Spiel arbeiten. Das Spiel soll folgende Voraussetzungen erfüllen:

- Mindestens eine **Spieler-Klasse**, über die der Spieler gesteuert werden kann. Wer mag, gerne auch ein Mehrspieler-Spiel z.B. Spieler 1 WASD, Spieler 2 Pfeiltasten.
- Mehrere **weitere Klassen**, z.B. eine Klasse pro **Level** / **Gegner** / **Hindernis** / **Gegenstand**, etc.
- Ein Klasse, die den **Startbildschirm** mit Infos zum Spiel und den Autoren darstellt.

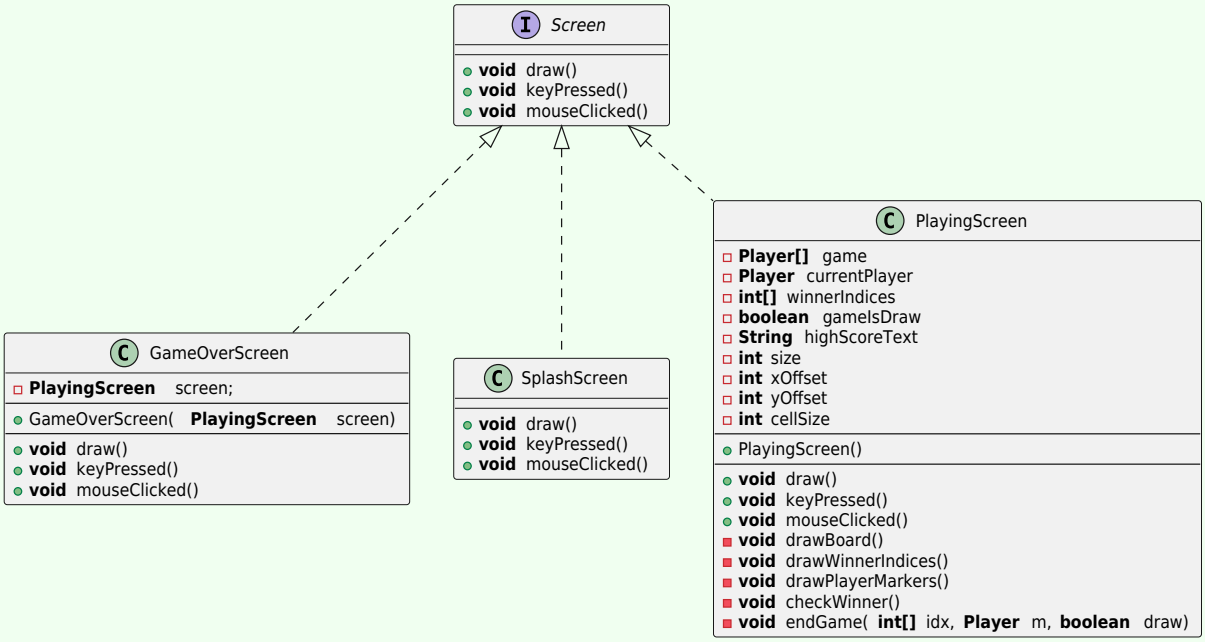
Beispiel: TicTacToe

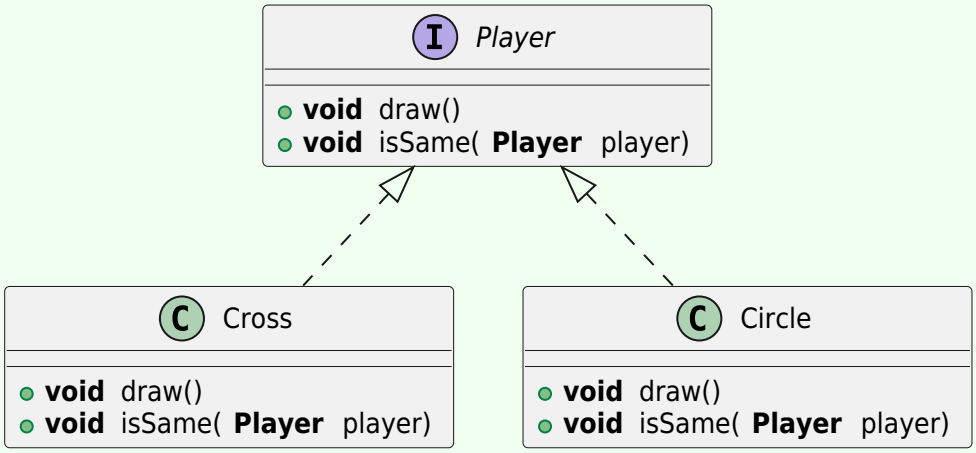
Nehmen wir als Beispiel das TicTacToe-Projekt aus der E-Phase:

- Hier gibt es mehrere Screens:
  - Der **SplashScreen** zeigt am Anfang Informationen über das Spiel.
  - Der **PlayingScreen** zeichnet das eigentliche Spiel.
  - Der **GameOverScreen** erscheint, wenn das Spiel beendet ist.
  - Alle drei Screens habe die drei Methoden `void draw()`, `void keyPressed()` und `void mouseClicked()` gemeinsam. Das kann man in dem so genannten Interface `interface Screen` als Gemeinsamkeiten zusammenfassen.
  - Lediglich der **PlayingScreen** hat noch mehr Methoden, die für die eigentliche Spielelogik verantwortlich sind.
  - Außerdem muss der **GameOverScreen** den zugehörigen **PlayingScreen** kennen, da er diesen im Hintergrund zeichnet.
- Ebenso gibt es zwei Spieler, **Cross** und **Circle**.
  - Diese haben ebenfalls Gemeinsamkeiten: Sie können mit `void draw()` gezeichnet werden und man kann mit `boolean isSame(Player player)` feststellen, ob ein anderer Spieler zur gleichen "Kategorie" gehört.

Demo: TicTacToe

screencast_from_18.06.2022_18_32_06.webm





Code

TicTacToe

TicTacToe.pde

```
Screen screen;

PFont headingFont;
PFont textFont;

void setup() {
 size(500, 500);

headingFont = createFont("Liberation Sans Bold", 32);
    textFont = createFont("Liberation Sans", 16);
```

```
    rectMode(CENTER);
   ellipseMode(CENTER);
 textAlign(CENTER, CENTER);

screen = new SplashScreen();
}

void draw() {
 screen.draw();
}

void keyPressed() {
 screen.keyPressed();
}

void mouseClicked() {
 screen.mouseClicked();
}

void setScreen(Screen newScreen) {
 screen = newScreen;
}
```

Screen

Screen.pde

```
interface Screen {
 public void draw();

public void keyPressed();

public void mouseClicked();
}
```

Player, Cross, Circle

Player.pde

```
interface Player {
void draw(int x, int y, int xOffset, int yOffset, int
    cellSize);
 boolean isSame(Player player);
}
```

```
class Cross implements Player {
  void draw(int x, int y, int xOffset, int yOffset, int
                        cellSize) {
   line(xOffset + x * cellSize + cellSize / 6, yOffset + y *
  cellSize + cellSize / 6, xOffset + (x + 1) * cellSize -
cellSize / 6, yOffset + (y + 1) * cellSize - cellSize / 6);
   line(xOffset + (x + 1) * cellSize - cellSize / 6, yOffset
  + y * cellSize + cellSize / 6, xOffset + x * cellSize +
cellSize / 6, yOffset + (y + 1) * cellSize - cellSize / 6);
                        }

             boolean isSame(Player player) {
      return player != null && player instanceof Cross;
                        }
                       }

            class Circle implements Player {
  void draw(int x, int y, int xOffset, int yOffset, int
                        cellSize) {
   ellipse(xOffset + x * cellSize + cellSize / 2, yOffset + y
* cellSize + cellSize / 2, 2*cellSize / 3, 2*cellSize / 3);
                        }

             boolean isSame(Player player) {
      return player != null && player instanceof Circle;
                        }
                       }
```

Playing

Playing.pde

```
class PlayingScreen implements Screen {
  final int[][] WINNING_COMBINATIONS = {
          { 0, 1, 2 }, // first row
         { 3, 4, 5 }, // second row
          { 6, 7, 8 }, // third row
        { 0, 3, 6 }, // first column
       { 1, 4, 7 }, // second column
        { 2, 5, 8 }, // third column
      { 0, 4, 8 }, // first diagonal
     { 2, 4, 6 }  // second diagonal
                        };
              Player[] game = {
               null, null, null,
               null, null, null,
                null, null, null
                        };
```

```
Player currentPlayer = null;
int[] winnerIndices = null;
boolean gameIsDraw = false;
String highScoreText = "";
int size;
int xOffset;
int yOffset;
int cellSize;

public PlayingScreen() {
size = min(width, height);
xOffset = (width - size) / 2;
yOffset = (height - size) / 2;
cellSize = size / 3;

gameIsDraw = false;
currentPlayer = null;
game = new Player[] {
null, null, null,
null, null, null,
null, null, null
};
winnerIndices = null;
}

public void draw() {
background(#CCCCCC);

drawWinnerIndices();
drawBoard();
drawPlayerMarkers();
}

public void keyPressed() { }

public void mouseClicked() {
int x = (mouseX - xOffset) / cellSize;
int y = (mouseY - yOffset) / cellSize;
int idx = y * 3 + x;

if (game[idx] != null) return;

if (currentPlayer == null || currentPlayer instanceof
Circle) {
currentPlayer = new Cross();
} else {
currentPlayer = new Circle();
}

game[idx] = currentPlayer;
```

```
                checkWinner();
                }

                void drawBoard() {
                  stroke(#000000);
                  strokeWeight(5);

    line(xOffset + cellSize, yOffset, xOffset + cellSize,
                    height - yOffset);
  line(xOffset + 2*cellSize, yOffset, xOffset + 2*cellSize,
                    height - yOffset);
 line(xOffset, yOffset + cellSize, width - xOffset, yOffset
                    + cellSize);
    line(xOffset, yOffset + 2*cellSize, width - xOffset,
                  yOffset + 2*cellSize);
                }

              void drawWinnerIndices() {
  if (winnerIndices == null || winnerIndices.length <= 0)
                    return;

      for (int i = 0; i < winnerIndices.length; i++) {
                int x = winnerIndices[i] % 3;
                int y = winnerIndices[i] / 3;

                    noStroke();
                   fill(#AACCEE);
    rect(xOffset + x * cellSize + cellSize / 2, yOffset + y
     * cellSize + cellSize / 2, cellSize, cellSize);
                    }
                   }

              void drawPlayerMarkers() {
          for (int i = 0; i < game.length; i++) {
                int x = i % 3;
                int y = i / 3;

                Player marker = game[i];

                    noFill();
                  strokeWeight(5);
                  stroke(#000000);

                if (marker != null) {
          marker.draw(x, y, xOffset, yOffset, cellSize);
                    }
                  }
                 }

              void checkWinner() {
        for (int[] indices : WINNING_COMBINATIONS) {
```

```
                Player firstMarker = game[indices[0]];
                        boolean failed = false;

                    if (firstMarker == null) continue;

                for (int i = 1; i < indices.length; i++) {
                     Player marker = game[indices[i]];

                     if (!firstMarker.isSame(marker)) {
                                failed = true;
                                     }
                                    }

            if ((firstMarker instanceof Cross || firstMarker
                 instanceof Circle) && !failed) {
                   endGame(indices, firstMarker, false);
                                return;
                                  }
                                 }

                                int usedCells = 0;

                for (int i = 0; i < game.length; i++) {
                                if (game[i] != null) {
                                     usedCells++;
                                      }
                                     }

                     if (usedCells == game.length) {
                        endGame(null, null, true);
                                     }
                                    }

  void endGame(int[] indices, Player marker, boolean isDraw) {
                      winnerIndices = indices;
                        gameIsDraw = isDraw;

              StringList highScores = new StringList();

             if (dataFile("highscores.txt").isFile()) {
         highScores.append(loadStrings("data/highscores.txt"));
                                     }

    String date = nf(year(), 4) + "-" + nf(month(), 2) + "-" +
 nf(day(), 2) + " " + nf(hour(), 2) + ":" + nf(minute(), 2) +
                      ":" + nf(second(), 2);
                         String text = isDraw
                                ? "draw"
       : ((marker instanceof Cross ? "cross" : "circle") + "@"
                  + join(nf(indices, 1), ","));
```

```
            highScores.append(date + " / " + text);

      saveStrings("data/highscores.txt", highScores.array());

                  if (highScores.size() > 0) {
                        int crossWins = 0;
                       int circleWins = 0;
                          int draw = 0;

                   for (String s : highScores) {
                  String winner = s.substring(22);

                    if (winner.indexOf("@") > 0) {
          winner = winner.substring(0, winner.indexOf("@"));
                                    }

                  if (winner.equals("cross")) crossWins++;
               else if (winner.equals("circle")) circleWins++;
                   else if (winner.equals("draw")) draw++;
                                    }

      highScoreText = "\n\nHighScores:\nCross: " + crossWins +
        "\nCircle: " + circleWins + "\nDraw: " + draw;

                  setScreen(new GameOverScreen(this));
                                     }
                                   }
                                 }
```

GameOver

GameOver.pde

```
            class GameOverScreen implements Screen {
               private PlayingScreen playingScreen;

      public GameOverScreen(PlayingScreen playingScreen) {
                this.playingScreen = playingScreen;
                                    }

                        public void draw() {
                          background(#CCCCCC);

                         playingScreen.draw();

                            fill(#77000000);
                              noStroke();
       rect(playingScreen.xOffset, playingScreen.yOffset, 6 *
```

```
      playingScreen.cellSize, 6 * playingScreen.cellSize);

                        fill(#FFFFFF);
                    textFont(headingFont);
               text("Game Over", width / 2, height / 4);

                        textFont(textFont);
                  String text = "The player using " +
   (playingScreen.currentPlayer instanceof Cross ? "crosses" :
                "circles") + " has won the game.";

                     if (playingScreen.gameIsDraw) {
                       text = "The game is a draw.";
                                  }

       text(text + "\n\nPress any key or click anywhere to play
again." + playingScreen.highScoreText, width / 2, height / 2);
                                  }

                      public void keyPressed() {
                    setScreen(new PlayingScreen());
                                  }

                     public void mouseClicked() {
                    setScreen(new PlayingScreen());
                                  }
                                 }
```

SplashScreen

SplashScreen.pde

```
              class SplashScreen implements Screen {
                        public void draw() {
                         background(#000000);

                           fill(#FFFFFF);

                        textFont(headingFont);
               text("TikTakToe", width / 2, height / 4);

                        textFont(textFont);
      text("A two-player game\n\nPress any key or click anywhere
to start playing\n\n© 2022 Christian Weber", width / 2, height
                                  / 2);
                                  }

                     public void keyPressed() {
```

```
                    setScreen(new PlayingScreen());
                                }

                     public void mouseClicked() {
                    setScreen(new PlayingScreen());
                                }
                               }
```