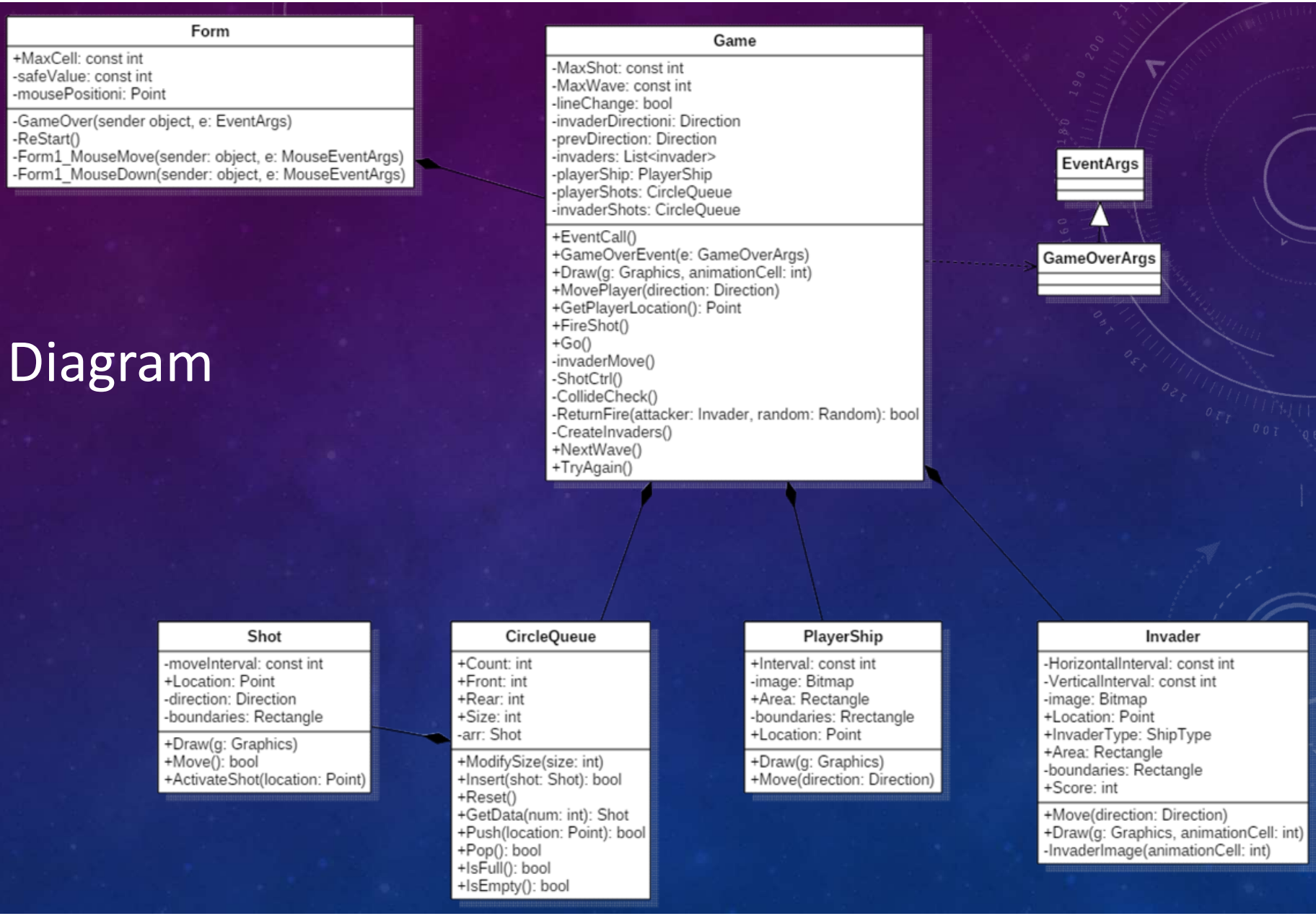

INVADER
박지용

Class Diagram



enum

```
enum ShipType
{    // name = score
    Bug = 50,
    Saucer = 40,
    Satellite = 30,
    Spaceship = 20,
    Star = 10
}
```

```
enum InvaderRow // x
{
    Bug = 50,
    Saucer = 110,
    Satellite = 170,
    Spaceship = 230,
    Star = 290
}
```

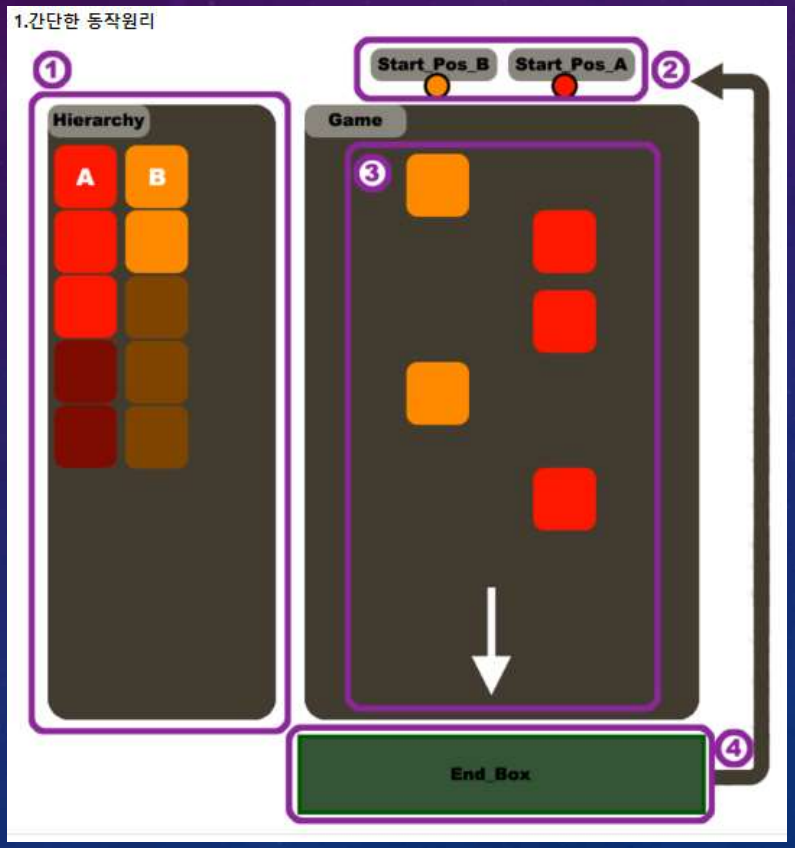
```
enum Col // y
{
    First = -140,
    Second = -70,
    Third = 0,
    Forth = 70,
    Fifth = 140
}
```

new Game()

```
public Game(Rectangle boundaries, Random random)
{
    this.boundaries = boundaries;
    this.random = random;

    playerShots = new CircleQueue(MaxShot);
    invaderShots = new CircleQueue(MaxWave);

    playerShip = new PlayerShip(new Point(boundaries.Width / 2, boundaries.Height - 90), boundaries);
    invaders = new List<Invader>();
    CreateInvaders();

    // 미사일 미리 생성해서 숨겨두기
    for (int i = 0; i <= MaxShot; i++)
        playerShots.Insert(new Shot(new Point(-100, -100), Direction.Up, boundaries));
    playerShots.Reset(); // rear를 다시 front 위치로

    for (int i = 0; i <= MaxWave + 3; i++)
        invaderShots.Insert(new Shot(new Point(-100, -100), Direction.Down, boundaries));
    invaderShots.Reset();
}
```

Object Pool Pattern 패턴?

- 객체를 필요로 할때 풀에 요청을 하고, 반환하고 일련의 작업을 수행하는 패턴.
  많은 수의 인스턴스를 생성할때 혹은 무거운 오브젝트를 매번 인스턴스화 할때 성능 향상을 가져오기도 합니다.
  예를들어, 데이터베이스에 접속하는 여러 객체를 만들때 매번 새로 생성하는 것보단,
  미리 생성된 풀에서 객체를 반환받아오는 것이 더 이득 입니다.



Game.Draw()

```
public void Draw(Graphics g, int animationCell)
{
    playerShip.Draw(g);

    for (int i = 0; i < invaders.Count; i++)
        invaders[i].Draw(g, animationCell);

    for (int i = playerShots.Front; i != playerShots.Rear; i++, i %= playerShots.Size)
        playerShots.GetData(i).Draw(g);

    for (int i = invaderShots.Front; i != invaderShots.Rear; i++, i %= invaderShots.Size)
        invaderShots.GetData(i).Draw(g);

    Twinkle();
}
```

Game.Go()

```
private void InvaderMove()
{
    /* ===========  동작 처리  =============== */
    var enemies = from invader in invaders
                  where invader.Location.X <= 10
                  || invader.Location.X >= boundaries.Width - 80
                  select invader;

    if (lineChange)
    {
        lineChange = false;
        invaderDirection = (prevDirection == Direction.Left) ? Direction.Right : Direction.Left;
    }
    // 라인을 바꿔야할 때
    else if (enemies.Count() != 0)
    {
        lineChange = true;
        prevDirection = invaderDirection;
        invaderDirection = Direction.Down;
    }

    for (int i = 0; i < invaders.Count; i++)
        invaders[i].Move(invaderDirection);
}
```

Game.Go()

```
invaders.Add(new Invader(ShipType.Bug, new Poir
invaders.Add(new Invader(ShipType.Saucer, new P
invaders.Add(new Invader(ShipType.Saucer, new P
invaders.Add(new Invader(ShipType.Satellite, ne
invaders.Add(new Invader(ShipType.Spaceship, ne
```

```
private void ShotCtrl()
{
    /* ============  Shot 처리  =============== */
    var invaderCols = from invader in invaders
                      group invader by invader.Location.X
                      into invaderCol
                      orderby invaderCol.Key descending
                      select invaderCol;

    int select = random.Next(invaderCols.Count()); // 중복 방지 필요
    if(invaderCols.Count() != 0)
        ReturnFire(invaderCols.ElementAt(select).Last(), random);

    // 나중에 CircleQueue에 함수로 구현할 것 // Delegate 사용해서 Pop, Draw
    for (int i = playerShots.Front; i != playerShots.Rear; i++, i %= playerShots.Size)
        if (!playerShots.GetData(i).Move()) playerShots.Pop();

    for (int i = invaderShots.Front; i != invaderShots.Rear; i++, i %= invaderShots.Size)
        if (!invaderShots.GetData(i).Move()) invaderShots.Pop();
}
```

MouseEvent

```
private const int AdjustmentValue = 10;
private Point mousePosition;

private void Form1_MouseMove(object sender, MouseEventArgs e)
{
    mousePosition = e.Location;
}

private void Form1_MouseDown(object sender, MouseEventArgs e)
{
    game.FireShot();
}
```

부족한 점

- Twinkle() 구현
- Invader 생성 시 Factory 패턴 사용
- 하나의 Invader가 여러 번 공격하는 문제
- QueueLoop을 메소드로 구현
- Shot 충돌 시 효과 넣기