CISC 1600/1610
Computer Science I

Programming a virtual world

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JMH 328A

How do we represent a complex problem?

- Outline what needs to be done (e.g., diagram of program steps)
- Determine C++ variables to use
- Determine C++ statements to use

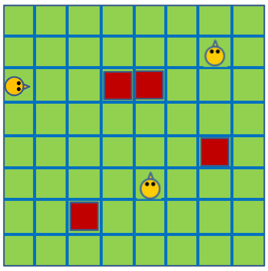
The world of a video game

Two-dimensional grid containing:

- Players ●
- Walls 🟥
- Open spaces 🟩

Each player has:

- Location
- Facing-direction



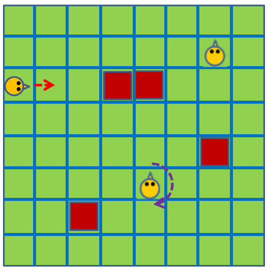
The world of a video game (continued)

For each character, request an action

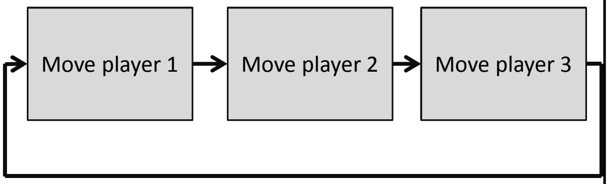
Possible actions

- Move forward
- Change direction

- Player 1 move forward
- Character 2 turn to face down



Progress of game



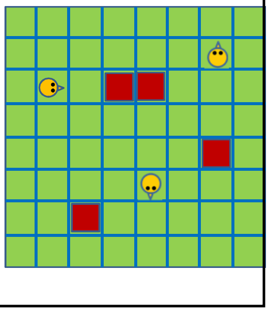
Representing the world

First approach:

- List locations of players and walls

```
int players[maxP][2];
int walls[maxW][2];

players[0][0]=2;
players[0][1]=1;
```



Representing the world

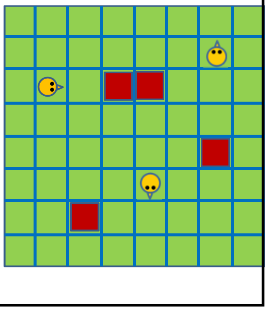
First approach:

- List locations of players and walls

```
players[0][0]=2;
players[0][1]=1;
walls[0][0]=2
walls[0][1]=3
```

Players
1: row 3, col 2
2: row 2, col 7
3: row 6, col 5

Walls
1: row 3, col 4
2: row 3, col 5
3: row 5, col 7
4: row 7, col 8



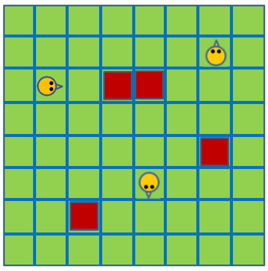
Representing the world

Second approach:

- Record the contents of each location

`char world[8][8];`
`world[0][0]='O';` 🟩
`world[0][1]='O';` 🟩
`world[1][6]='A';` ●
`world[2][1]='B';` ●
`world[2][3]='W';` 🟥
`world[2][4]='W';` 🟥

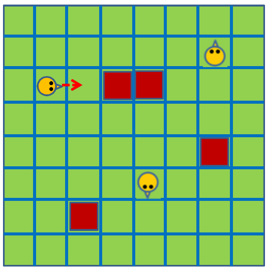
(players labeled as A, B, C)



Moving through the world

To move player 1 forward by 1 box

- Find player current location
- Check if target location is empty
- Update player location



Find player 1 location

Approach 1:

- Look up `players[0][0]` and `players[0][1]`

Approach 2:

- Loop through each element of world, look for `'B'`

Approach 1 is faster!

Check if target location empty

- Approach 1:
- Look at locations of all players and walls – confirm none are `xNew, yNew`

- Approach 2:
- Check `world[xNew][yNew]=='O'`

Approach 2 is faster!

Abstraction

- Function – a set of actions called by one word
- Class – a set of data held in one word

Information hiding

- So long as action/data unit acts correctly, we don’t need to know the details
- Hiding details can prevent accidents in programming (e.g., overdrawn account)