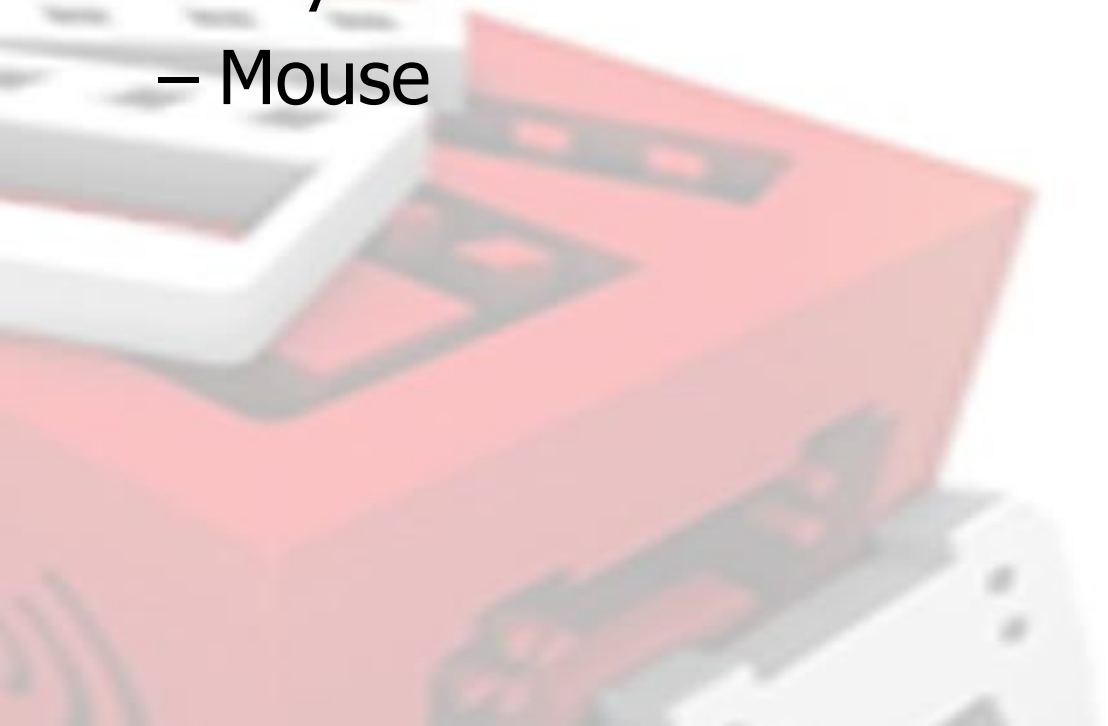
CMP105 Games Programming

Input

This week

- Window messages
- Building an input class
- Handling input
  - Keyboard
  - Mouse



Input

- We only need to worry about processing input from our main windows
  - Dialogues / Message boxes handle all input from mouse and keyboard behind the scenes
- What sends Window Messages?
  - Keyboard and Mouse Input
    - Key presses
    - Mouse movement
  - Changes made to the window
    - Gained/lost focus
    - Resize
  - etc

Messages

- Every Windows Message has 4 components
  - WHO
    - Handle to the object that sent the message
    - HWND
  - WHAT
    - A message identifier, a positive natural number
    - UINT
  - Data
    - Could be anything and comes in two parts
    - WPARAM = WORD parameter (Uint)
    - LPARAM = LONG parameter (Long)
    - Contents depend on message

Messages

- SFML handles default processing of messages
  - Over 220 Window messages
- Luckily we don’t need to process all these messages
  - Focus only on the ones we are interested in
  - Let the default processes handle the rest
    - If we leave the messages unhandled

Basic Message Handling

- We current already handle the window being closed and resized

```
sf::Event event;
while (window.pollEvent(event))
{
    switch (event.type)
    {
        case sf::Event::Closed:
            window.close();
            break;
        case sf::Event::Resized:
            window.setView(sf::View(sf::FloatRect(0.f, 0.f, (float)event.size.width, (float)event.size.height)));
            break;
```

Keyboard events/messages

- Two messages
  - Sf::Event::KeyPressed
  - Sf::Event::keyReleased
  - Event data will contain which key the event is related to
- We need to listen for these events and store which key has been pressed/released

- There is another option
  - We can interrogate the hardware to get the current state of a key
  - However this causes issues with some types of input
    - And does not halt on loss of focus

Keyboard

- Add to the switch statement
- Pass key code into an Input class (we will build this)

```
        break;
    case sf::Event::KeyPressed:
        // update input class
        input.setKeyDown(event.key.code);
        break;
    case sf::Event::KeyReleased:
        //update input class
        input.setKeyUp(event.key.code);
        break;
```

Storing keyboard input

- Each key has a corresponding enum
  - This is part of the event
    - Event.key.code
  - Each key enum value can be evaluated to an integer
  - Sf::Key::Space = 57
- Traditionally, in Windows this is handled as an ASCII value

Storing keyboard input

- We can represent keys as numbers this means it is easy to store information on them
- Store key presses in a Boolean array
  - Bool keys[256];
  - True == pressed/down
  - False == released/up
  - When a key is pressed set value to true, when released set to false
  - Can check state of the key by querying the array for Boolean values
- Alternative would be a massive collection of *if statements*
  - This is bad programming

Capture input

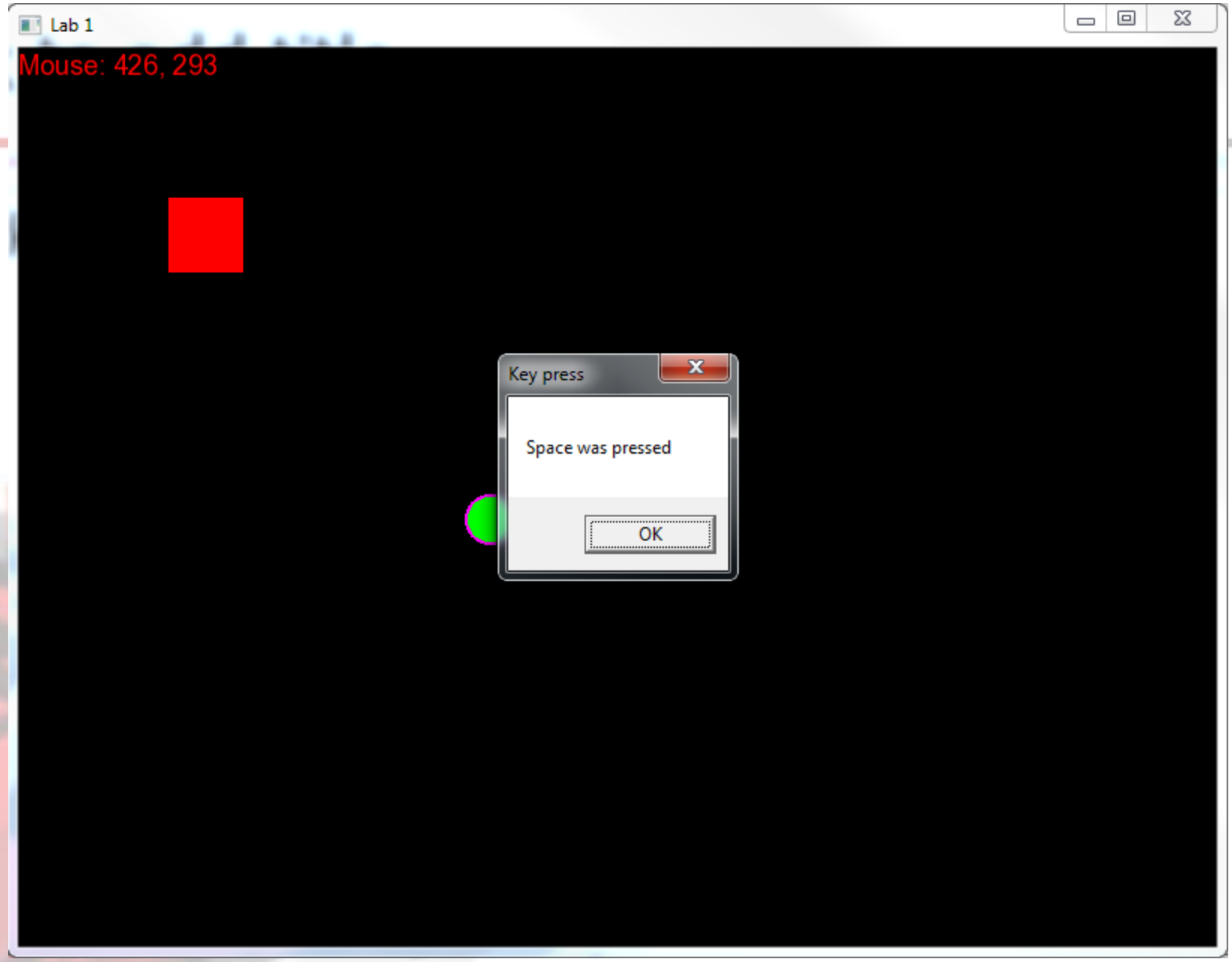
- The main game loop has two processes
  - Window has received a message and needs to process it
    - Little actual processing should be done in here
    - Handle the message/event, storing key presses, mouse movement etc
      - Handled by other classes later
  - Once all messages have been processed
    - We perform all of our game processing /rendering etc
    - Here we can take action on keyboard input and check the “keys” array
    - Or pass the input class to other objects for input handling

Key press example

- This takes place after processing all Window messages

```
        // if space is pressed
        if (input.isKeyDown(sf::Keyboard::Space))
        {
            input.setKeyUp(sf::Keyboard::Space);
            MessageBox(NULL, L"Space was pressed", L"Key press", MB_OK);
        }

        // game loop
        game.handleInput();
        game.update();
        game.render();
```


Lab 1
Mouse: 426, 293
Key press
Space was pressed
OK

Mouse Input

- Mouse events
  - Sf::Event::MouseButtonPressed
  - Sf::Event::MouseButtonReleased
  - Sf::Event::MouseMoved
- Event data includes which mouse button or current mouse position
- It is also possible to detect scroll wheel events

Storing Mouse input

- Similar to key presses
  - Boolean values to track if mouse button is pressed or released
    - bool left;
    - bool right;
    - bool middle;
  - Set Boolean variables to true when button is pressed and false when the mouse button is released
  - Process in similar method as key presses, check variable state if true do something (display message box, etc.)

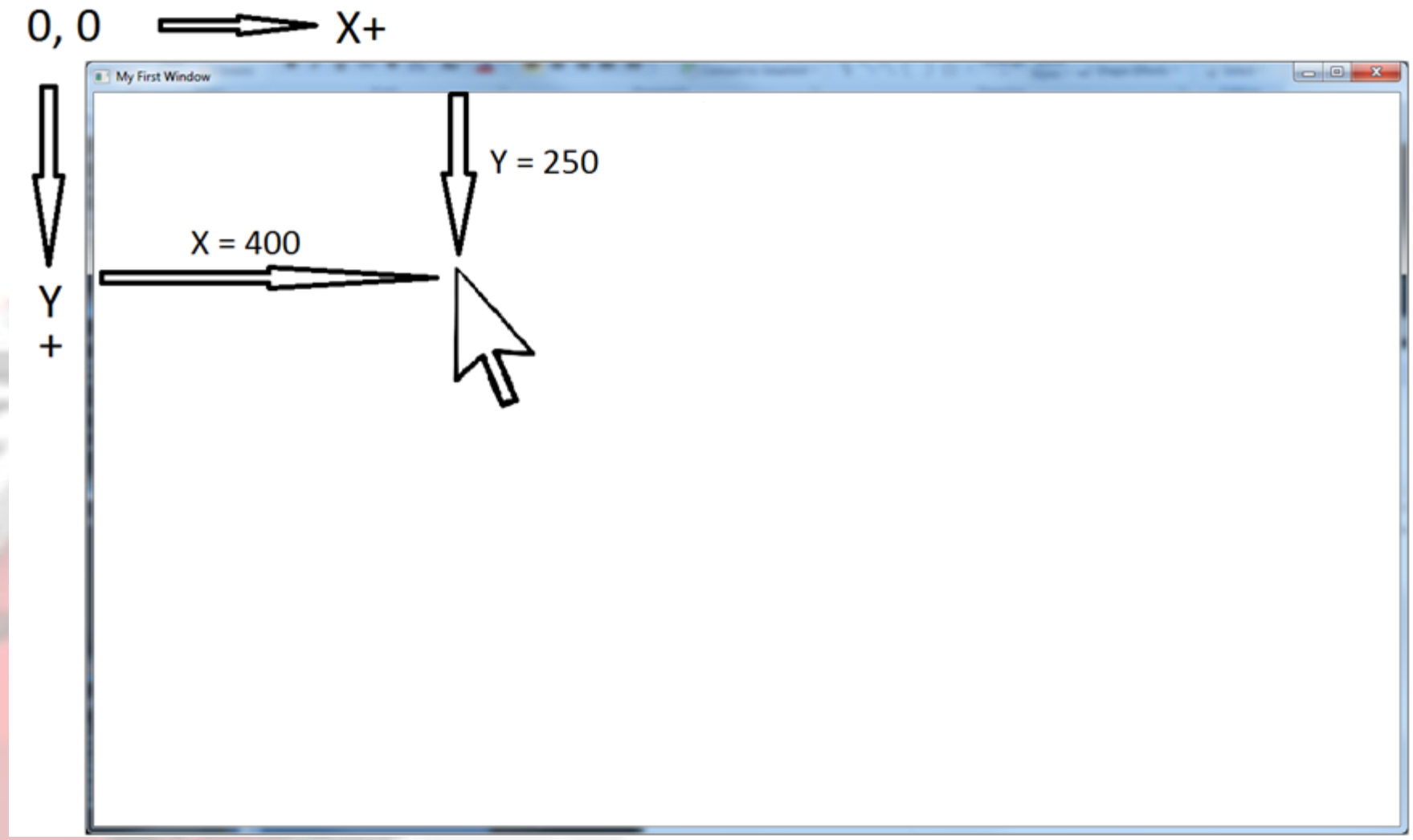
Storing Mouse input

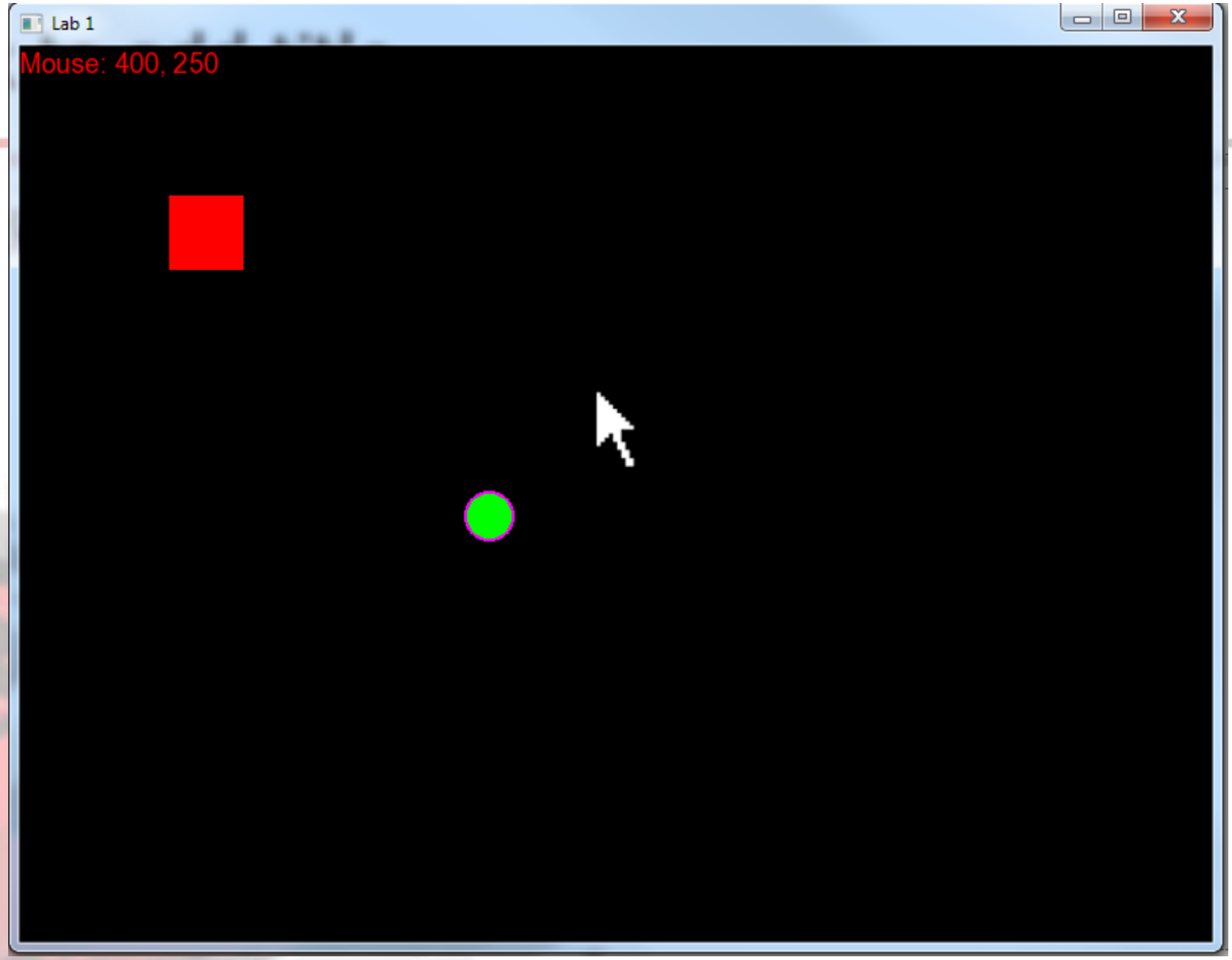
- Mouse Moved
  - Called every time the mouse has moved
  - Event data stores current mouse position
  - Can track the mouse position either in relation to the window or the desktop
- Input class needs to store X and Y position of mouse (integer)
  - We are interested in the mouse's position in relation to the window

Store Mouse input

```
        case sf::Event::MouseMoved:
            //update input class
            input.setMousePosition(event.mouseMove.x, event.mouseMove.y);
            break;
        case sf::Event::MouseButtonPressed:
            if (event.mouseButton.button == sf::Mouse::Left)
            {
                //update input class
                input.setMouseLeftDown(true);
            }
            break;
        case sf::Event::MouseButtonReleased:
            if (event.mouseButton.button == sf::Mouse::Left)
            {
                //update input class
                input.setMouseLeftDown(false);
            }
            break;
```

Coordinates reminder




Lab 1
Mouse: 400, 250

Bring it all together

- We have seen how to store and process keyboard and mouse events
- Now we need to bring this all together into a working application
- The best way to do this is to create an Input Class
  - An object that will handle all our input needs
  - This object can be passed into multiple objects which can handle their specific input needs
  - This means creating two new files
    - Input.h
    - Input.cpp

Input.h

- Requires
  - Mouse struct
  - Boolean array for tracking keys
    - Bool keys[256];
  - Functions
    - Getters and setters for key press/release
    - Return if specific key is pressed
    - Similar for mouse + mouse position

```h
#pragma once

class Input
{
private:
    struct Mouse
    {
        int x, y;
        bool left;
    };

public:
    void setKeyDown(int key);
    void setKeyUp(int key);
    bool isKeyDown(int key);

    void setMouseX(int lx);
    void setMouseY(int ly);
    void setMousePosition(int lx, int ly);
    int getMouseX();
    int getMouseY();
    // Some functions missing. You will need to add these.

private:
    bool keys[256]{ false };
    Mouse mouse;
};
```

Input.cpp (not all functions)

```cpp
#include "Input.h"

void Input::setKeyDown(int key)
{
    keys[key] = true;
}

void Input::setKeyUp(int key)
{
    keys[key] = false;
}

bool Input::isKeyDown(int key)
{
    return keys[key];
}
```

```cpp
void Input::setMouseX(int lx)
{
    mouse.x = lx;
}

void Input::setMouseY(int ly)
{
    mouse.y = ly;
}
```

Adding the Input class

- Need to include a few files (in Game.h)
  - #include “Input.h”
  - #include <windows.h>
  - #include <string.h>

- Create Input object in Main.cpp
- Pass a pointer to object into Game object (requires updating game object)

```
Input input;
Game game(&window, &input);
```

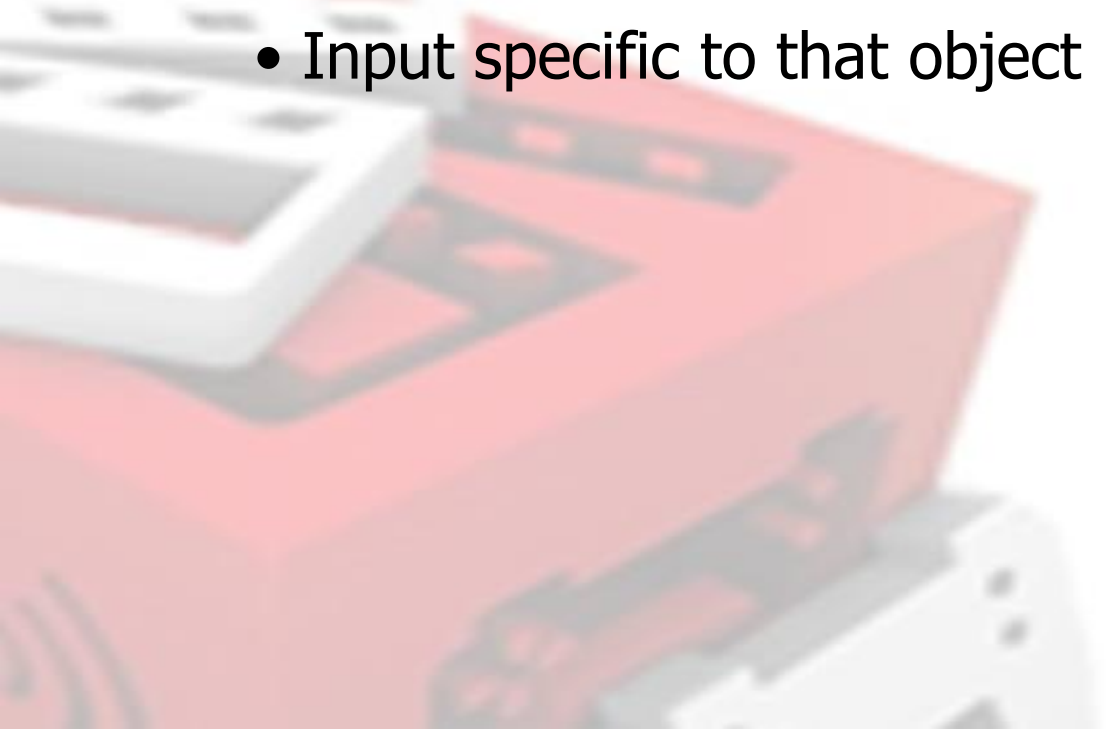
Process events

- Add to the events loop and capture keyboard and mouse events
- Updating the input class as needed

```
sf::Event event;
while (window.pollEvent(event))
{
    switch (event.type)
    {
        case sf::Event::Closed:
            window.close();
            break;
        case sf::Event::Resized:
            window.setView(sf::View(sf::FloatRect(0.f, 0.f, (float)event.size.width, (floa
            break;
        case sf::Event::KeyPressed:
            // update input class
            input.setKeyDown(event.key.code);
            break;
        case sf::Event::KeyReleased:
            //update input class
            input.setKeyUp(event.key.code);
            break;
        case sf::Event::MouseMoved:
            //update input class
            input.setMousePosition(event.mouseMove.x, event.mouseMove.y);
            break;
```

Handle input

- This can be done in two locations
  - In the game loop (main.cpp)
    - Window specific input
  - In the game class (or other objects)
    - Input specific to that object



Handle input

- Inside the game loop
  - Detects the space key being pressed
  - Outputs message box

```
// if space is pressed
if (input.isKeyDown(sf::Keyboard::Space))
{
    input.setKeyUp(sf::Keyboard::Space);
    MessageBox(NULL, L"Space was pressed", L"Key press", MB_OK);
}

// game loop
game.handleInput();
game.update();
game.render();
```

Handle Input

- Alternatively
  - Events can be processed in the handle input function in game
    - Game related inputs
  - Or the input class can be passed onto other objects for further processing
    - E.g. a player class would contain code on handling inputs related to player control

Live demo

- Please work
- Please work
- Please work

In the labs

- Building input class
- Doing stuff with keyboard and mouse
  - Detecting key presses
  - Mouse movement and button presses