

CT5510: Computer Graphics

Introduction

BOCHANG MOON



About Me

- Assistant professor in Institute of Integrated Technology at GIST
 - Graduate Program of Culture Technology
 - Joined GIST in Sep. 2016
- Post-Doctoral researcher at Disney Research (Nov. 2014 – July 2016)
- Ph.D from KAIST (Feb. 2008 – Aug. 2014)
- Main research topics:
 - Computer graphics
 - Rendering, denoising, ray tracing



Information

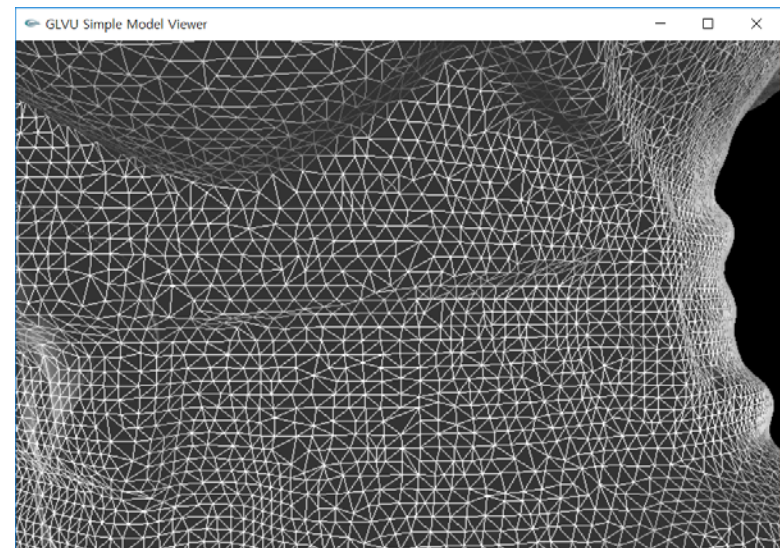
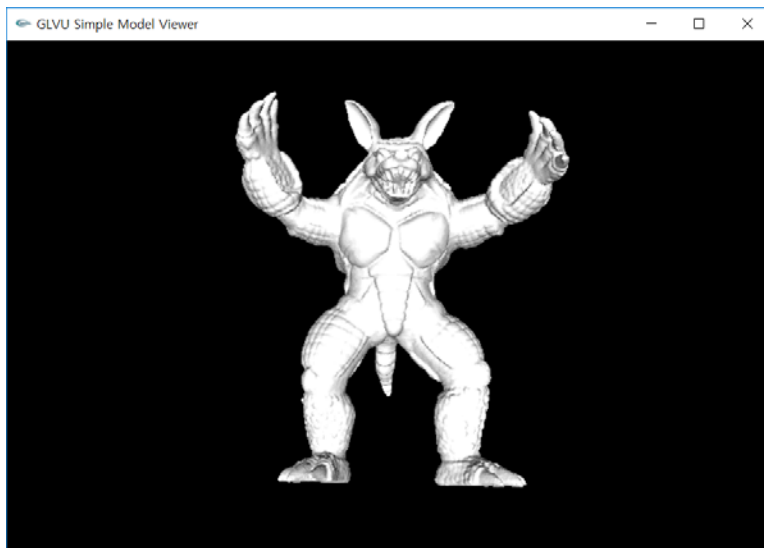
- Instructor: Bochang Moon
- Email: bmoon@gist.ac.kr
- Office: 106 Dasan Building

- Office hours
 - 2:30 – 4:00pm on Mon. or by appointment (via email)

- Class time
 - 1:00 – 2:30pm on Mon. and Wed.

Graphics Areas

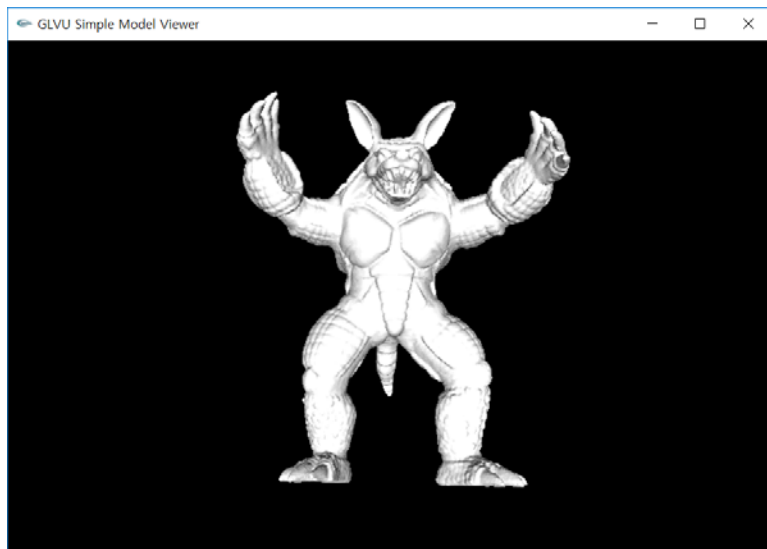
- Modeling
 - A technique to deal with mathematical specification of shape and appearance that can be stored in computers



e.g., triangle mesh

Graphics Areas

- Rendering
 - A algorithm to generate digital images from 3D models



3D model

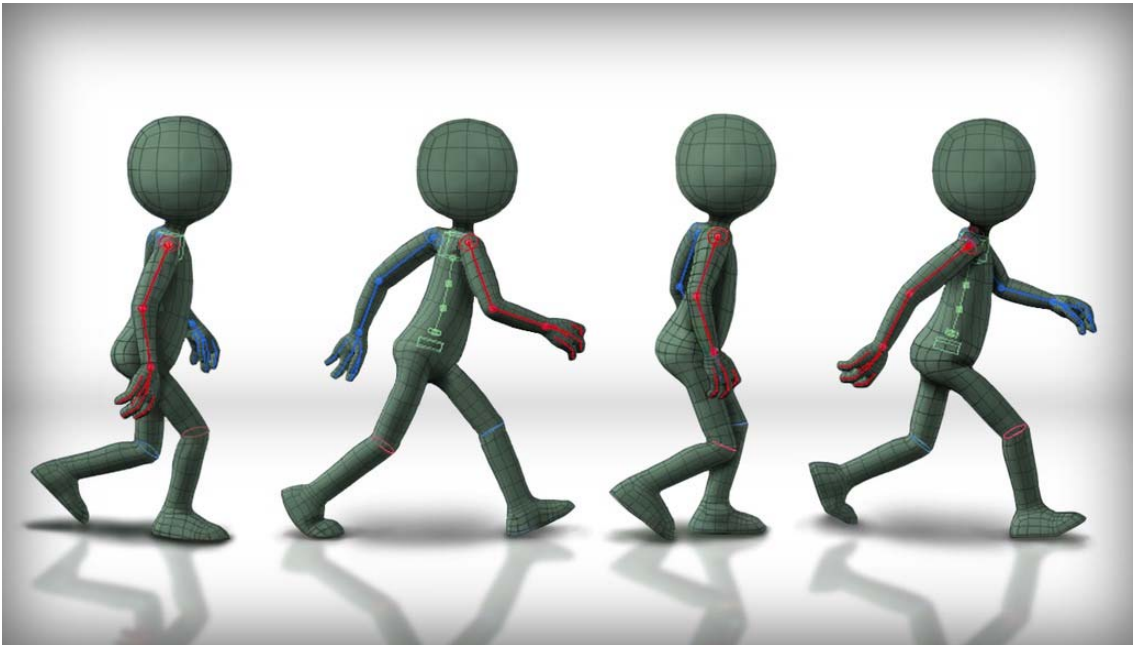


Rendered image



Graphics Areas

- Animation
 - Address how to create motion of virtual models over time



Images from <http://www.digitaltutors.com>

Graphics Areas

- Core areas
 - Modeling
 - Rendering
 - Animation
- Other areas
 - User Interface
 - Virtual Reality
 - Visualization
 - Image Processing
 - 3D scanning
 - Computational photography
 - etc.

Application of Computer Graphics

- 3D Animation



Application of Computer Graphics

- Visual Effects in Movies



from <http://wonderfulengineering.com>

Application of Computer Graphics

- Games



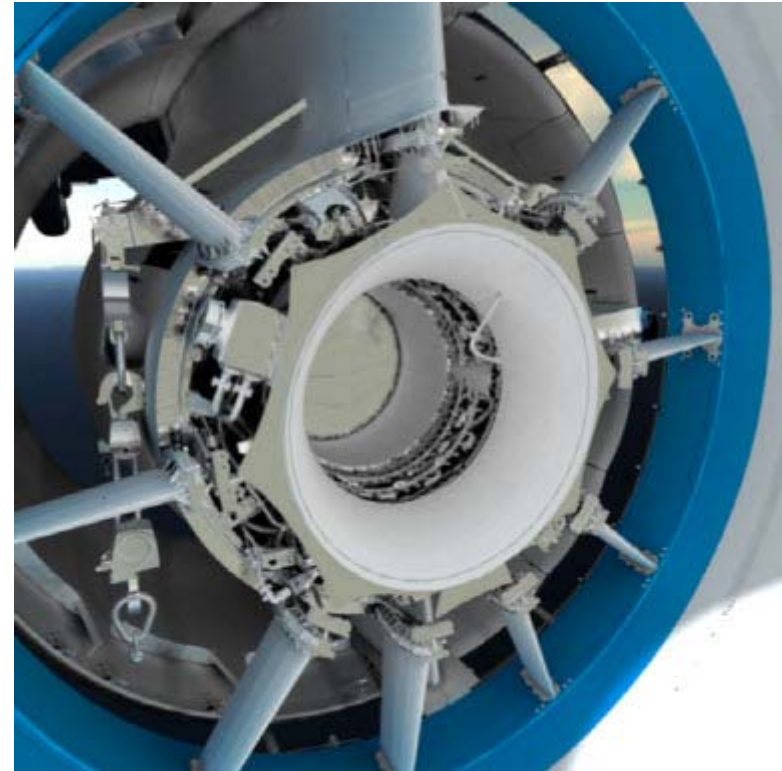
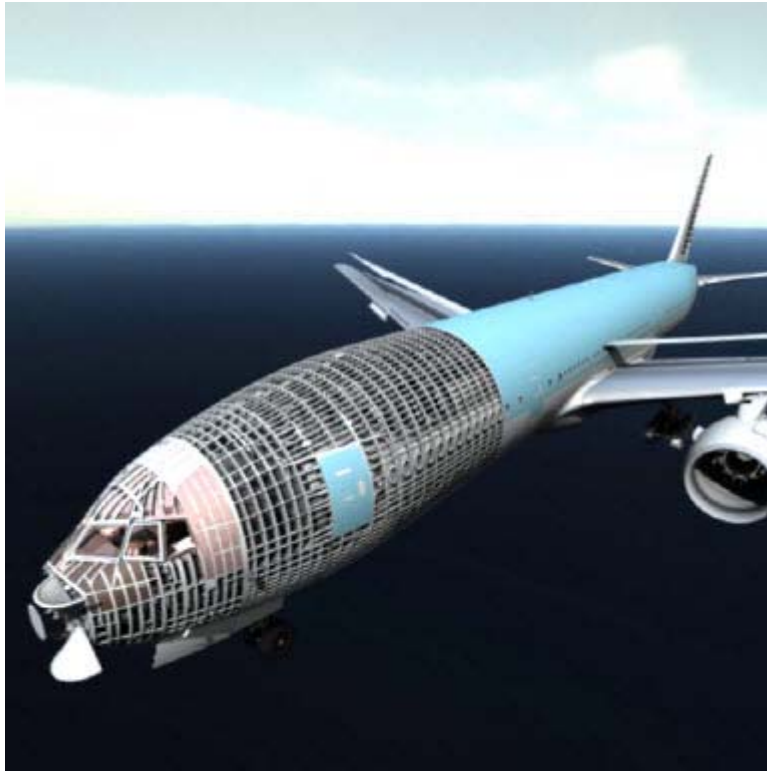
Application of Computer Graphics

- Augmented and virtual reality



Application of Computer Graphics

- Visualization



[Kim et al. 2013]

Some Recent Images



from pbrt.org

Some Recent Images

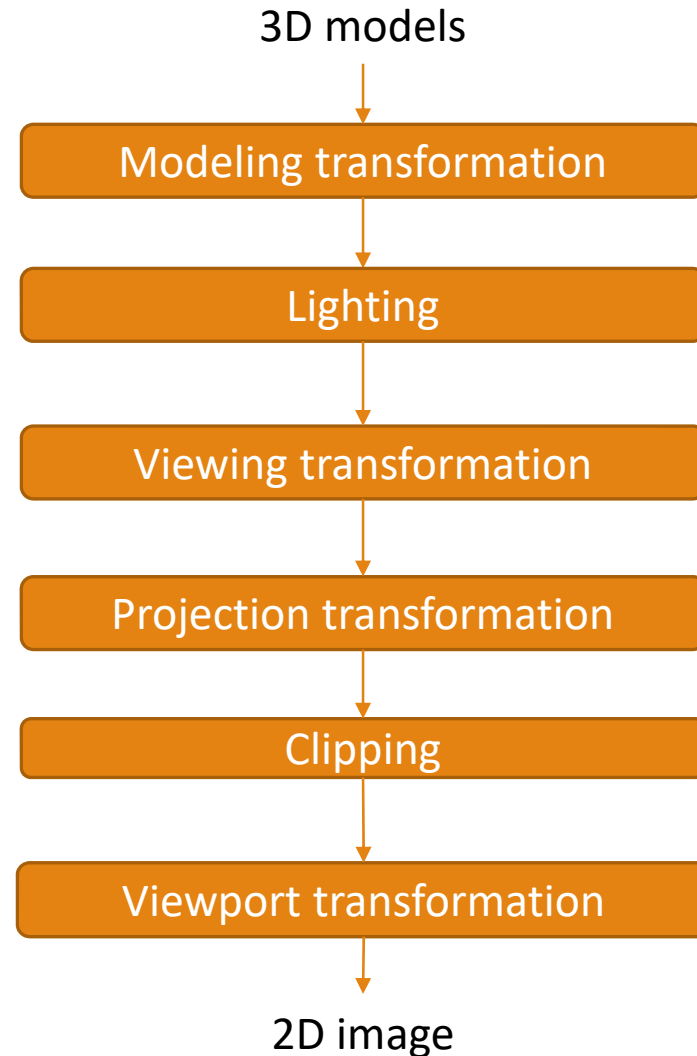


from pbrt.org

Course Overview

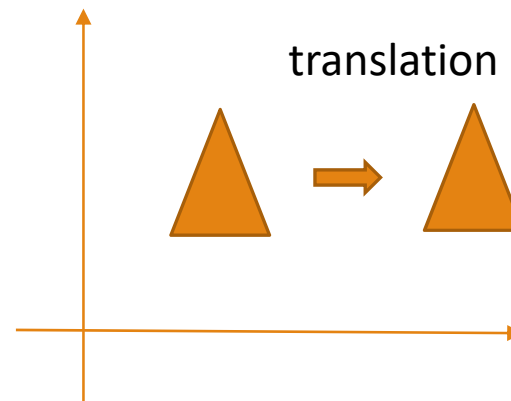
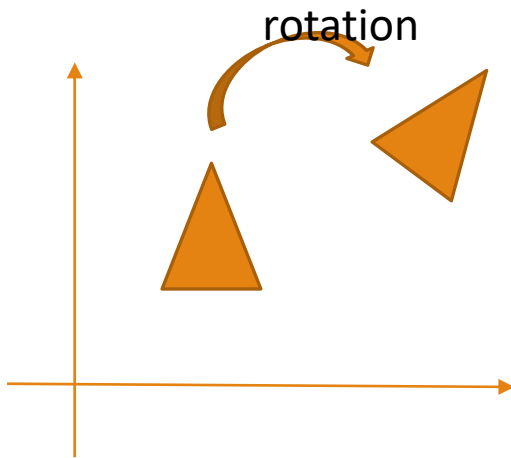
- Provide fundamental concepts of computer graphics such as graphics
 - Graphics pipeline & rasterization
 - Transformation
 - Local illumination and shading
 - Texture mapping
 - Ray casting
 - Ray tracing
 - Global illumination
- Learn how to generate digital images from virtual objects, lights, etc.

Graphics Pipeline and Rasterization



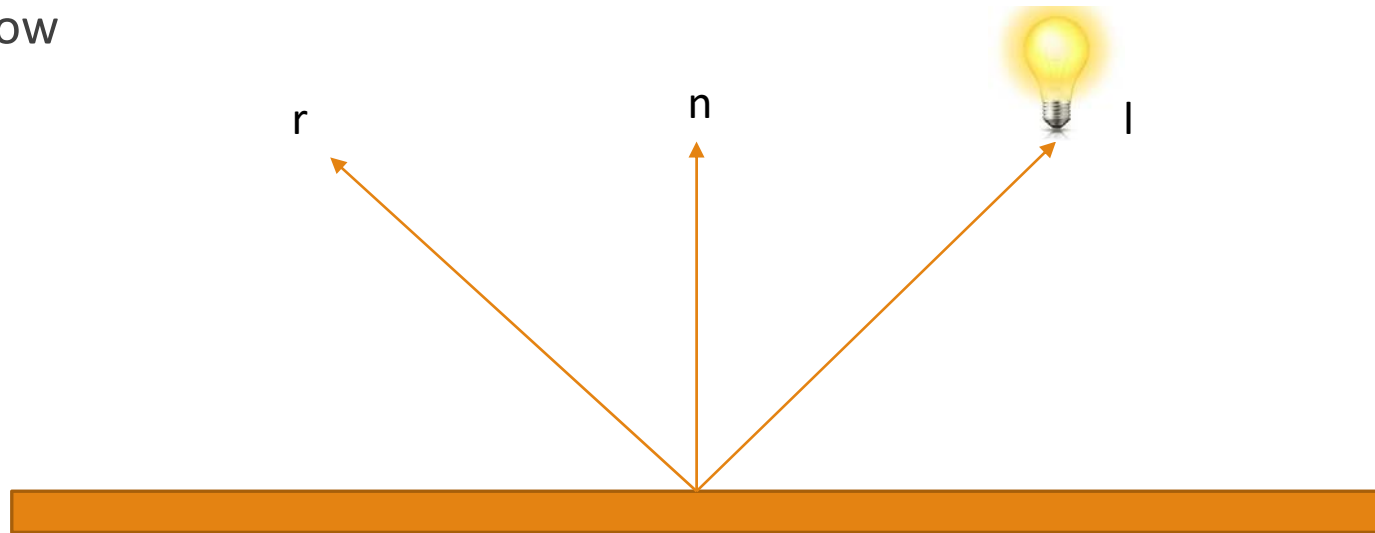
Transformations

- Affine transformations
- Viewing transformation
- ...

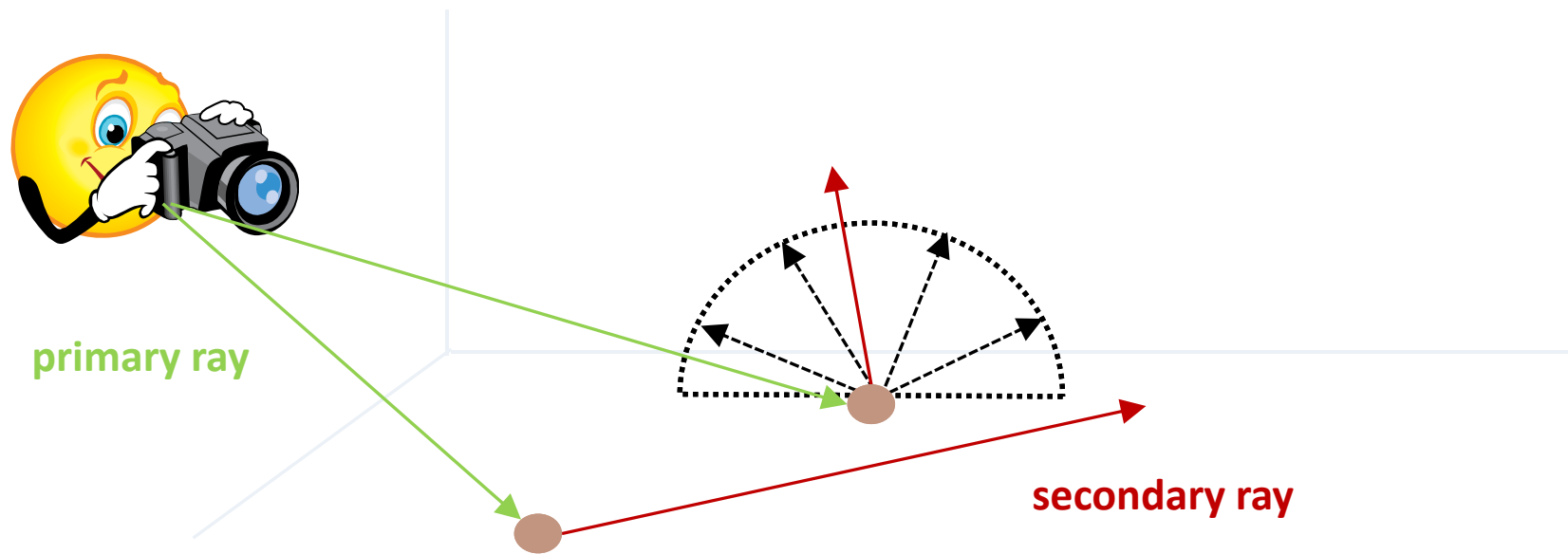


Local Illumination and Shading

- Shading
 - Flat
 - Gouraud
 - Phong
- Shadow



Ray Casting and Tracing



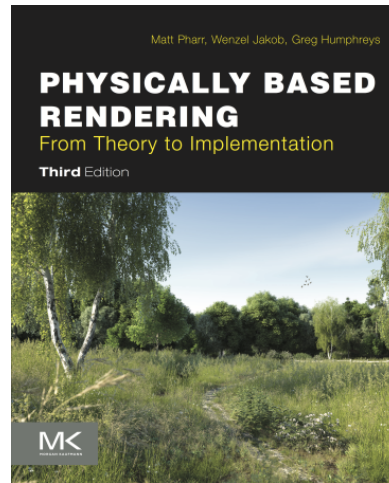
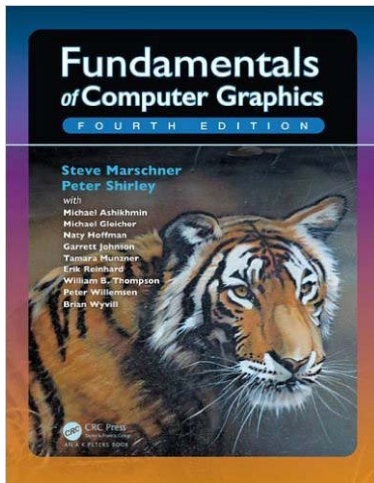
Global Illumination

- Simulate realistic lighting
 - Reflections
 - Refractions
 - Shadows
 - Diffuse inter-reflections
 - Caustics

- Global illumination methods
 - Path tracing
 - Photon mapping

Textbook and References

- Book



- Papers

- <http://kesen.realtimerendering.com/>
- SIGGRAPH, SIGGRAPH Asia, etc.

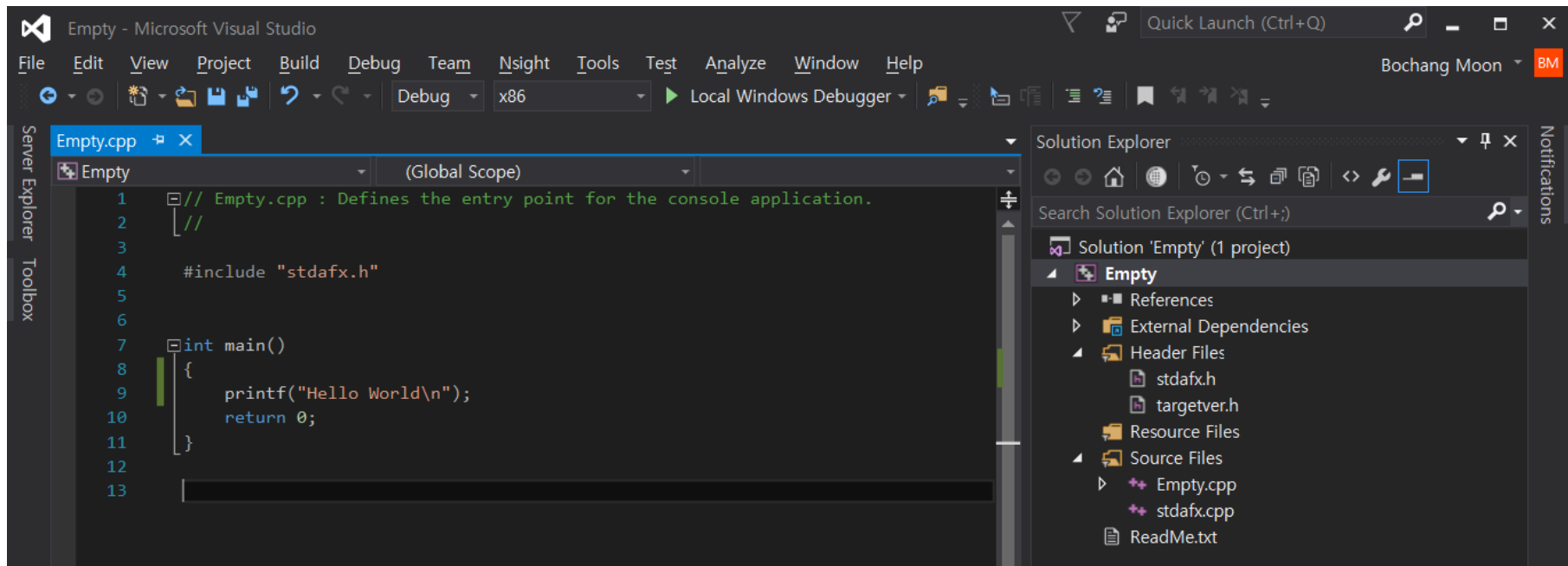


Grading

- Mid-term exam: 30%
- Final-term exam: 40%
- Programming assignment: 20%
- Attendance: 10%
 - No absences: 10, One absences: 9, Two absences: 7, Three absences: 4
 - Four or more absences: 0
 - Late two times: one absence
 - I will call your name at the beginning of the class

Prerequisite for This Course

- Basic programming knowledge (e.g., c/c++)
 - e.g., if you can implement a simple program (e.g., “hello world”), you will be okay.
 - Check whether you can understand the following:



The screenshot displays the Microsoft Visual Studio IDE. The main editor window shows the source code for 'Empty.cpp' in a 'Global Scope'. The code is as follows:

```
1 // Empty.cpp : Defines the entry point for the console application.
2 //
3
4 #include "stdafx.h"
5
6
7 int main()
8 {
9     printf("Hello World\n");
10    return 0;
11 }
12
13
```

The Solution Explorer on the right shows the project structure for 'Solution 'Empty' (1 project)'. The project contains the following files and folders:

- References
- External Dependencies
- Header Files
 - stdafx.h
 - targetver.h
- Resource Files
- Source Files
 - Empty.cpp
 - stdafx.cpp
 - ReadMe.txt

Otherwise,

- Check whether you can do it or not
 - Download Visual Studio 2015 community and install it
 - Google “Hello World c++” and learn how to implement it

Introduce Yourself

