

# Lecture #19. 사운드 및 패키징

2D 게임 프로그래밍

이대현 교수



한국공학대학교  
TECH UNIVERSITY OF KOREA

# 학습 내용

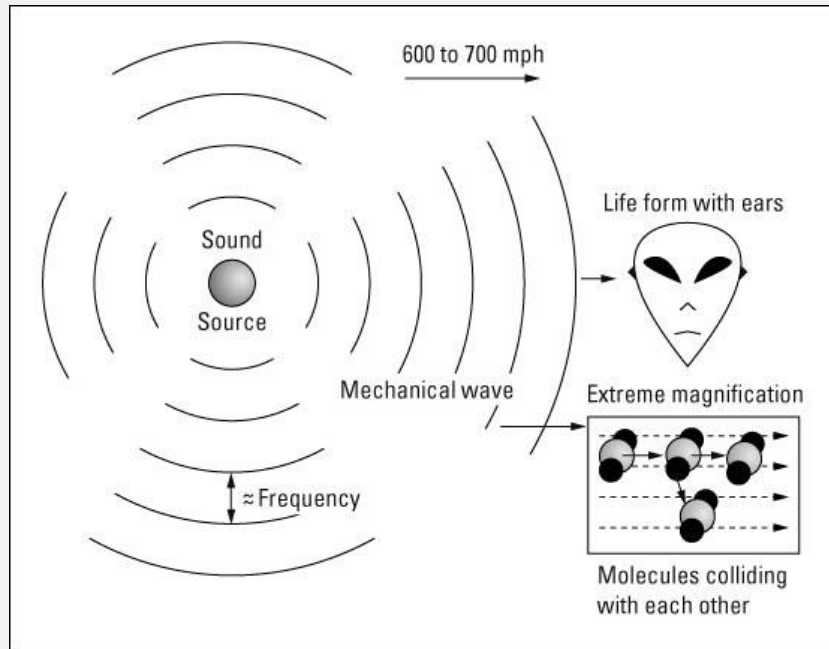
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- 컴퓨터 사운드의 이해
- Pico2d의 사운드 플레이
- PyInstaller 를 이용한 실행 파일 building
- Installer의 제작

# 사운드란 무엇인가?

## ■ 사운드

- 음원으로부터의 기계적 진동이 공기 등의 매체를 통해 전파되는 것.
- 전파되는데 시간이 걸린다.
  - 공기:  $344\text{m/s}$
  - 바다:  $1478\text{ m/s}$
  - 강철:  $5064\text{ m/s}$



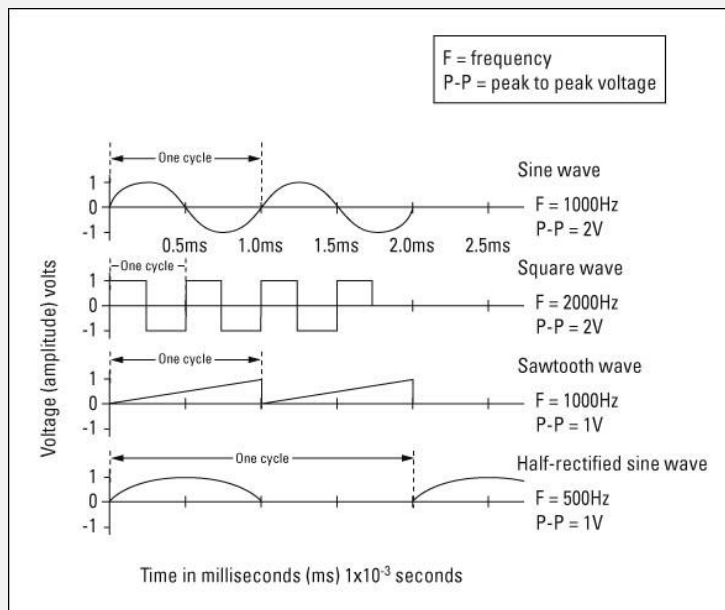
# 진폭과 주파수

## ■ 진폭(Amplitude)

- 파형의 크기

## ■ 주파수(Frequency)

- 초당 특정 파형이 반복되는 횟수. 단위는 Hz
- 가청 주파수: 20 - 20,000 Hz
- 남자: 20 - 20,000 Hz
- 여자: 70 - 30,000 Hz



# 디지털 사운드와 합성 사운드

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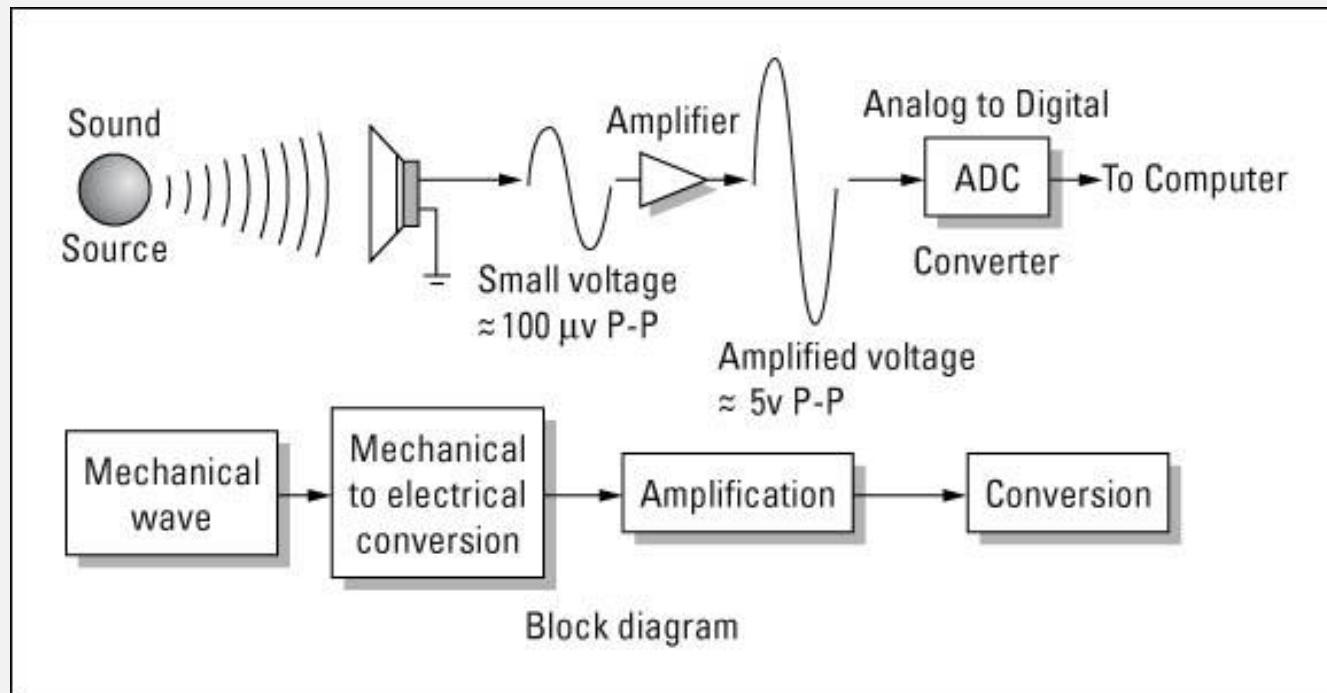
- 디지털 사운드(Digital Sound)

- 소리의 직접적인 녹음
- 효과음등에 사용(폭발, ...)

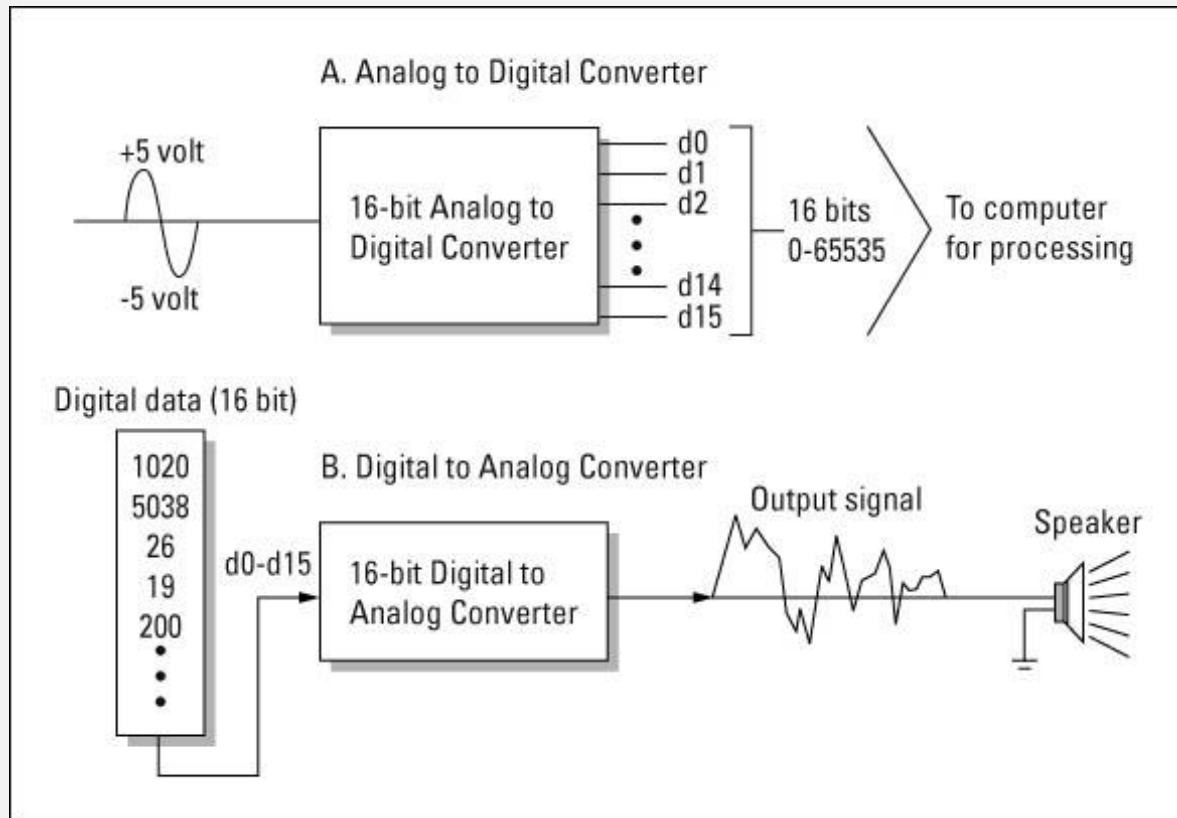
- 합성 사운드

- 알고리즘과 톤 발생기에 의하여 합성된 소리.
- 주로 음악의 재생에 사용.

# 디지털 사운드의 기록



# 디지털 사운드의 재생



# 디지털 사운드의 샘플링 주파수와 데이터 비트수

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## ■ 샘플링 속도

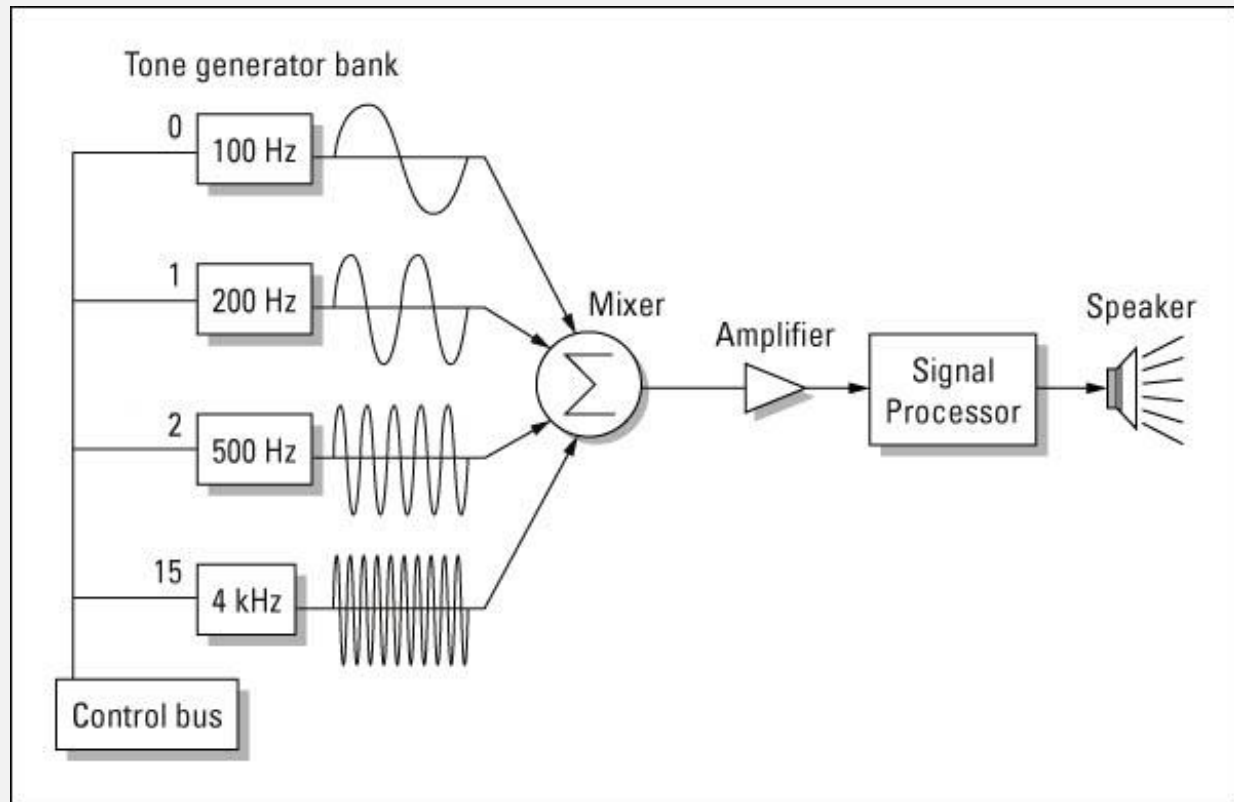
- 디지털 사운드를 기록할 때, 초당 몇번의 샘플링을 하는가?
- 샘플링되는 사운드 주파수보다 2배 이상으로 샘플링을 해야함.

## ■ 샘플 당 비트수(bits per samples)

- 8 비트 샘플: 256개의 진폭 크기. 게임 효과음 등에는 충분.
- 16 비트 샘플: 65536개의 진폭 크기. 음악 등에 사용.



# 합성 사운드의 재생



# 미디(MIDI)

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- **미디 (MIDI: Musical Instruments Digital Interface)**
  - 음악 재생을 기술하는 일종의 언어.

Turn on Channel 1 with a B flat

Turn on Channel 2 with a C sharp

Turn off Channel 1.

...

Turn all channels off.

# 청크(Chunk)와 채널(Channel)

---

## ■ 청크

- 일정한 크기를 가지는 사운드 데이터.

## ■ 채널

- 소리를 전달하는 통로.
- 모노: 1채널
- 스테레오: 2채널
- 영화: 5.1 채널, 7.1 채널 등등.



배경 음악 구현



```
class FixedBackground:
```

```
    def __init__(self):
        self.image = load_image('TUK_GROUND_FULL.png')
        self.cw = get_canvas_width()
        self.ch = get_canvas_height()
        self.w = self.image.w
        self.h = self.image.h
        self.bgm = load_music('football.mp3')
        self.bgm.set_volume(32)
        self.bgm.repeat_play()
```

# Music 관련 function 들

---

- 음악 파일(mp3, ogg)의 로딩

- load\_music(파일이름)

- 음악 연주 기능

- repeat\_play() - 반복재생
- play(n) - n 번 재생
- set\_volume(v) - 소리 크기 0~128
- get\_volume() - 현재 소리 크기
- stop() - 중단
- pause() - 일시정지
- resume() - 재개



이펙트사운드 구현

# ball.py (1)



```
class Ball:
    image = None
    zombie_eat_sound = None
    boy_eat_sound = None

    def __init__(self, x = None, y = None):
        if Ball.image == None:
            Ball.image = load_image('ball21x21.png')
        self.x = x if x else random.randint(100, server.background.w - 100)
        self.y = y if y else random.randint(100, server.background.h - 100)

        if not Ball.zombie_eat_sound:
            Ball.zombie_eat_sound = load_wav('zombie_pickup.wav')
            Ball.boy_eat_sound = load_wav('pickup.wav')
            Ball.zombie_eat_sound.set_volume(32)
            Ball.boy_eat_sound.set_volume(32)
```



## ball.py (2)



```
def handle_collision(self, group, other):  
    match group:  
        case 'boy:ball':  
            Ball.boy_eat_sound.play()  
            game_world.remove_object(self)  
        case 'zombie:ball':  
            Ball.zombie_eat_sound.play()  
            game_world.remove_object(self)
```

# Wav 관련 function 들

---

- 이펙트 파일(wav)의 로딩
  - load\_wav(파일이름)
- 이펙트 재생 기능
  - repeat\_play() - 반복재생
  - play(n) - n 번 재생
  - set\_volume(v) - 소리 크기 0~128
  - get\_volume() - 현재 소리 크기

# main.py가 실행되기 위해 필요로 하는 것들... (1)

---

- 여러분이 작성한 000.py
- 리소스: image, json, font, mp3, wav 파일 등등

## mygame.py가 실행되기 위해 필요로 하는 것들...(2)

### ■ Pico2d 가 활용하는 SDL 라이브러리 DLL

```
import pico2d
import os
print(os.getenv('PYSDL2_DLL_PATH'))
```

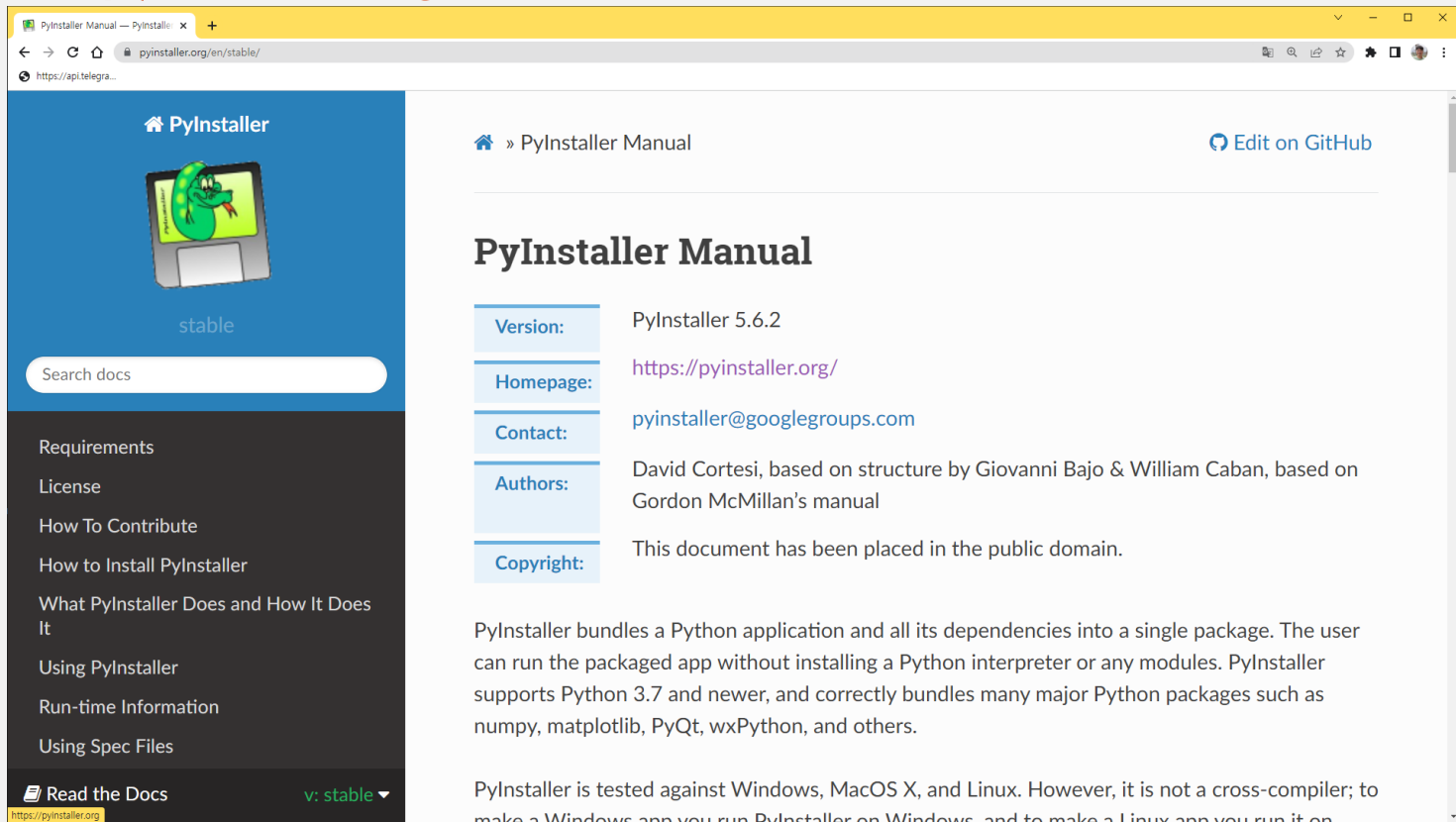
libFLAC-8	dll
libfreetype-6	dll
libjpeg-9	dll
libmikmod-2	dll
libmodplug-1	dll
libogg-0	dll
libpng16-16	dll
libtiff-5	dll
libvorbis-0	dll
libvorbisfile-3	dll
libwebp-4	dll
SDL2	dll
SDL2_image	dll
SDL2_mixer	dll
SDL2_ttf	dll
smpeg2	dll
zlib1	dll



mygame.py 를  
Mygame.exe 로 변환

# PyInstaller

■ <http://www.pyinstaller.org/>



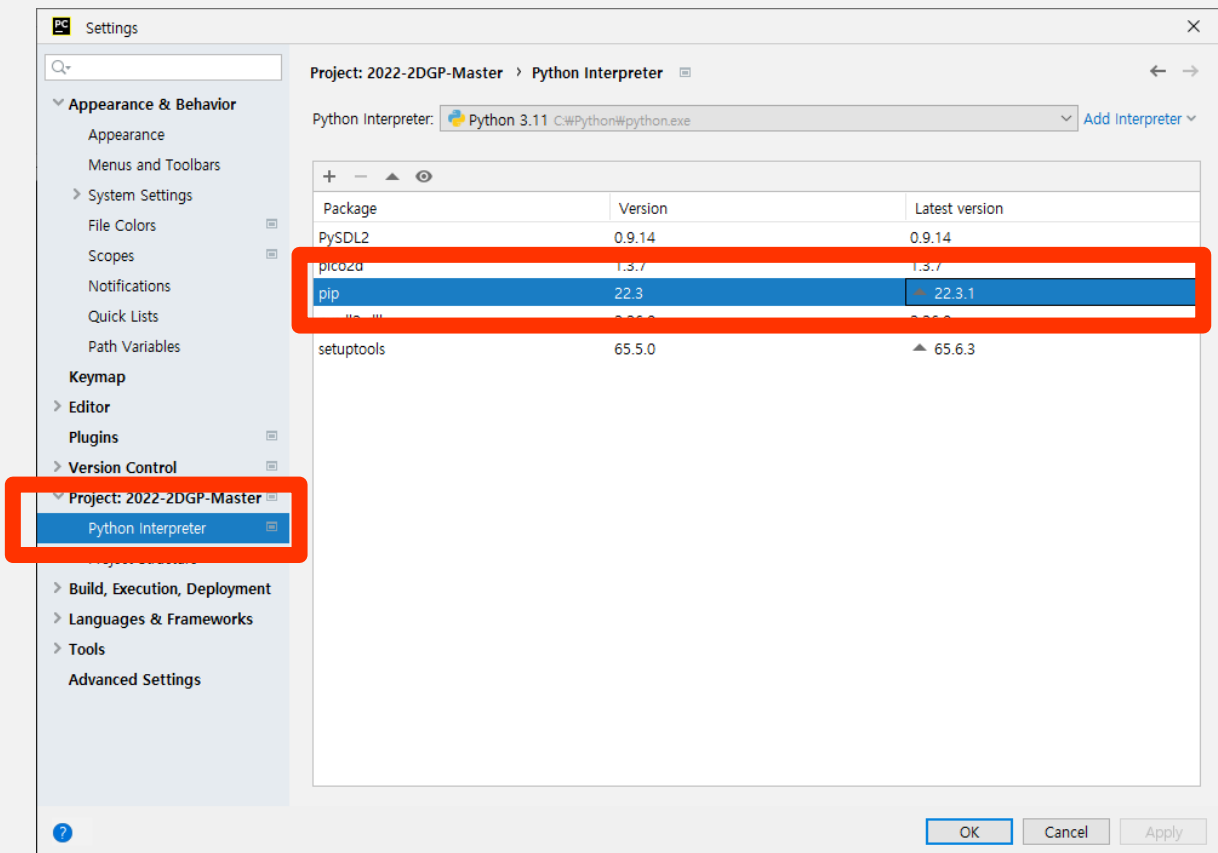
The screenshot shows the PyInstaller Manual website in a web browser. The browser's address bar displays the URL `pyinstaller.org/en/stable/`. The website has a blue header with the PyInstaller logo (a green cartoon character on a laptop) and the word "stable" below it. A search bar is present. On the left, a dark sidebar lists navigation links: Requirements, License, How To Contribute, How to Install PyInstaller, What PyInstaller Does and How It Does It, Using PyInstaller, Run-time Information, and Using Spec Files. At the bottom of the sidebar is a link to "Read the Docs" and a version selector set to "v: stable". The main content area has a breadcrumb "» PyInstaller Manual" and a link to "Edit on GitHub". The title "PyInstaller Manual" is prominently displayed. Below it is a table with metadata:

Version:	PyInstaller 5.6.2
Homepage:	<a href="https://pyinstaller.org/">https://pyinstaller.org/</a>
Contact:	<a href="mailto:pyinstaller@googlegroups.com">pyinstaller@googlegroups.com</a>
Authors:	David Cortesi, based on structure by Giovanni Bajo & William Caban, based on Gordon McMillan's manual
Copyright:	This document has been placed in the public domain.

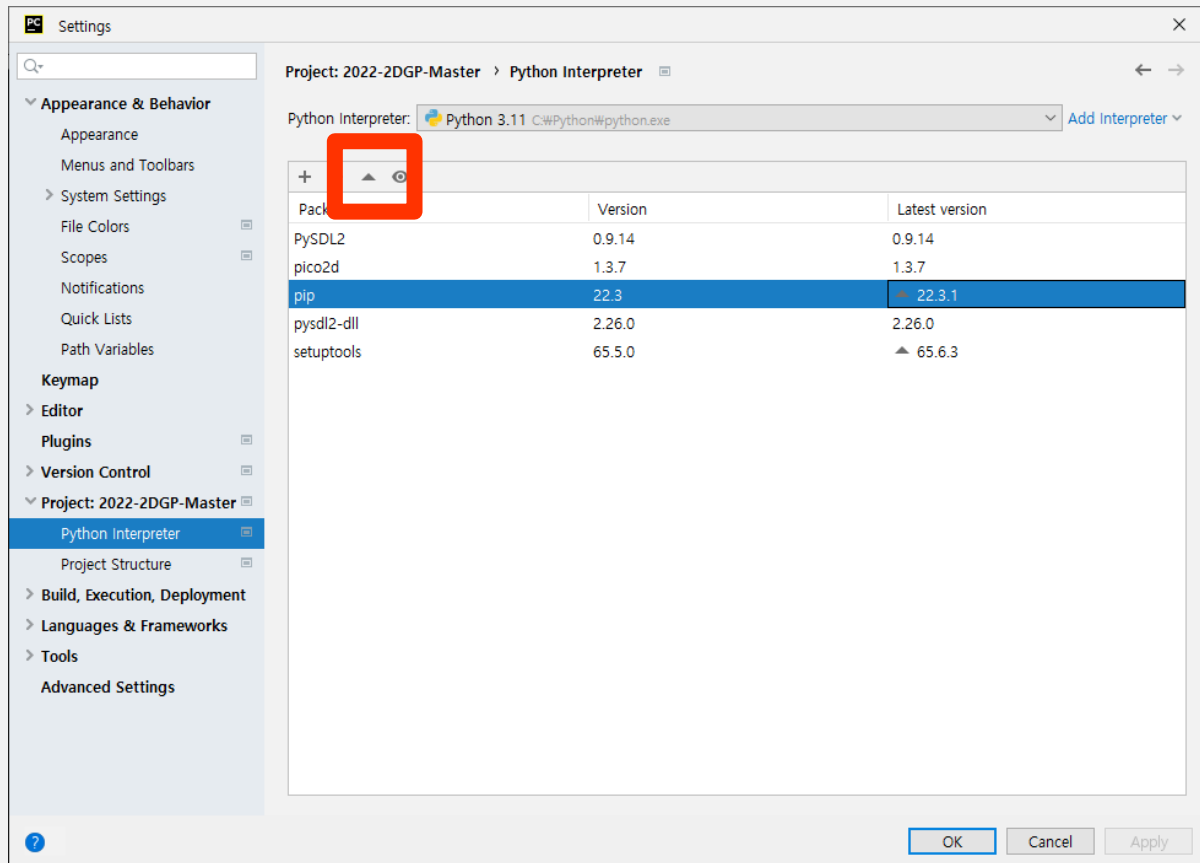
Below the table, a paragraph states: "PyInstaller bundles a Python application and all its dependencies into a single package. The user can run the packaged app without installing a Python interpreter or any modules. PyInstaller supports Python 3.7 and newer, and correctly bundles many major Python packages such as numpy, matplotlib, PyQt, wxPython, and others."

At the bottom, another paragraph states: "PyInstaller is tested against Windows, MacOS X, and Linux. However, it is not a cross-compiler; to make a Windows app you run PyInstaller on Windows, and to make a Linux app you run it on Linux."

# PyCharm: pip 설치 확인

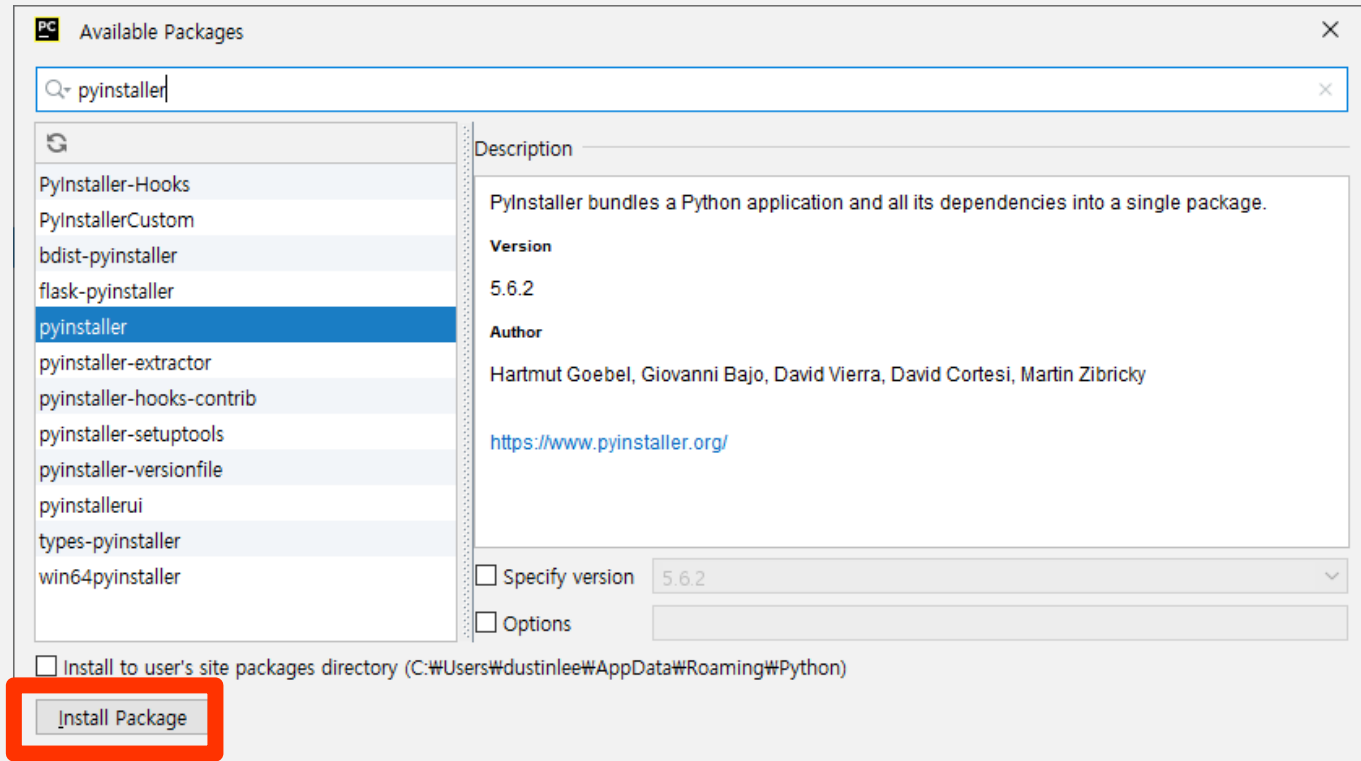


# PyCharm: pip 설치 및 version upgrade

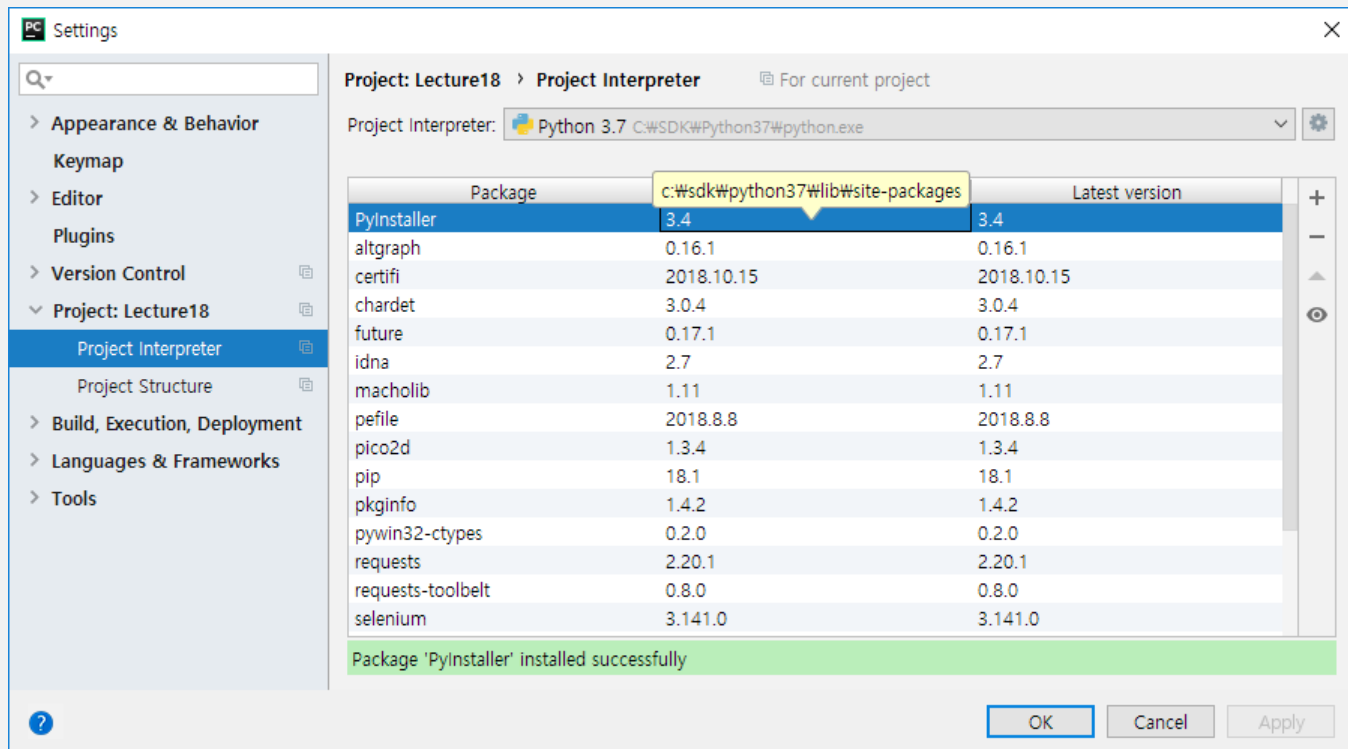




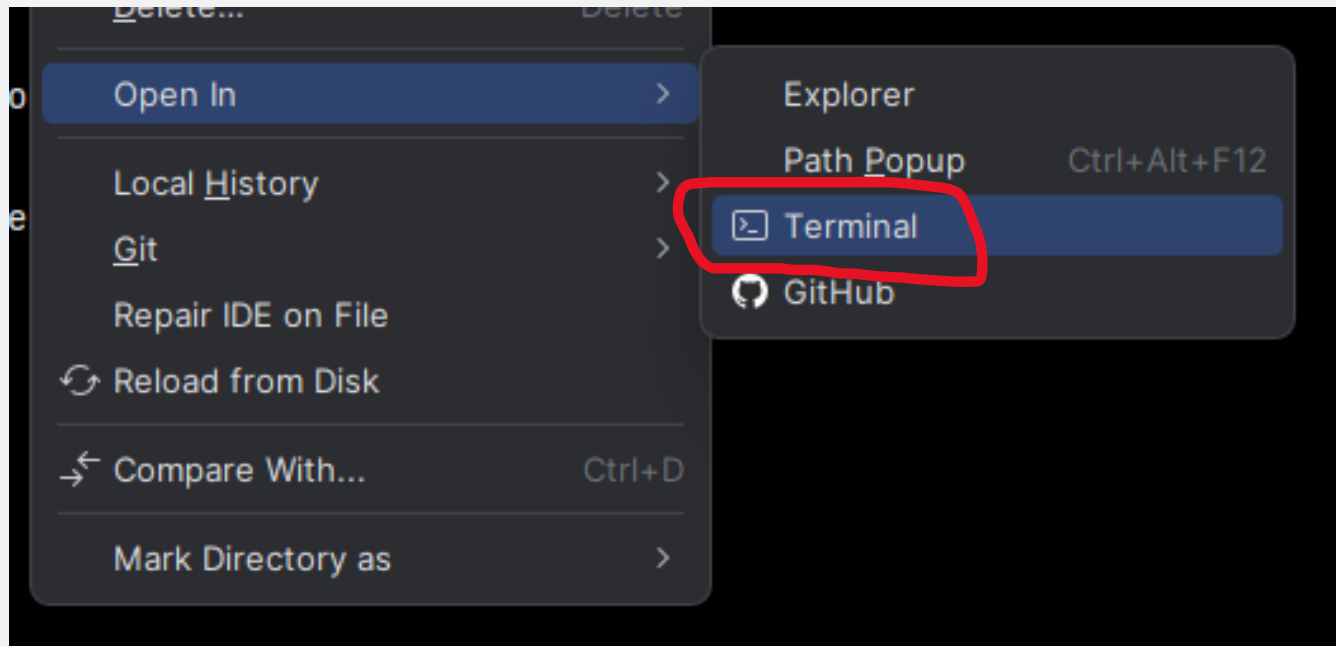
# PyCharm: PyInstaller 설치



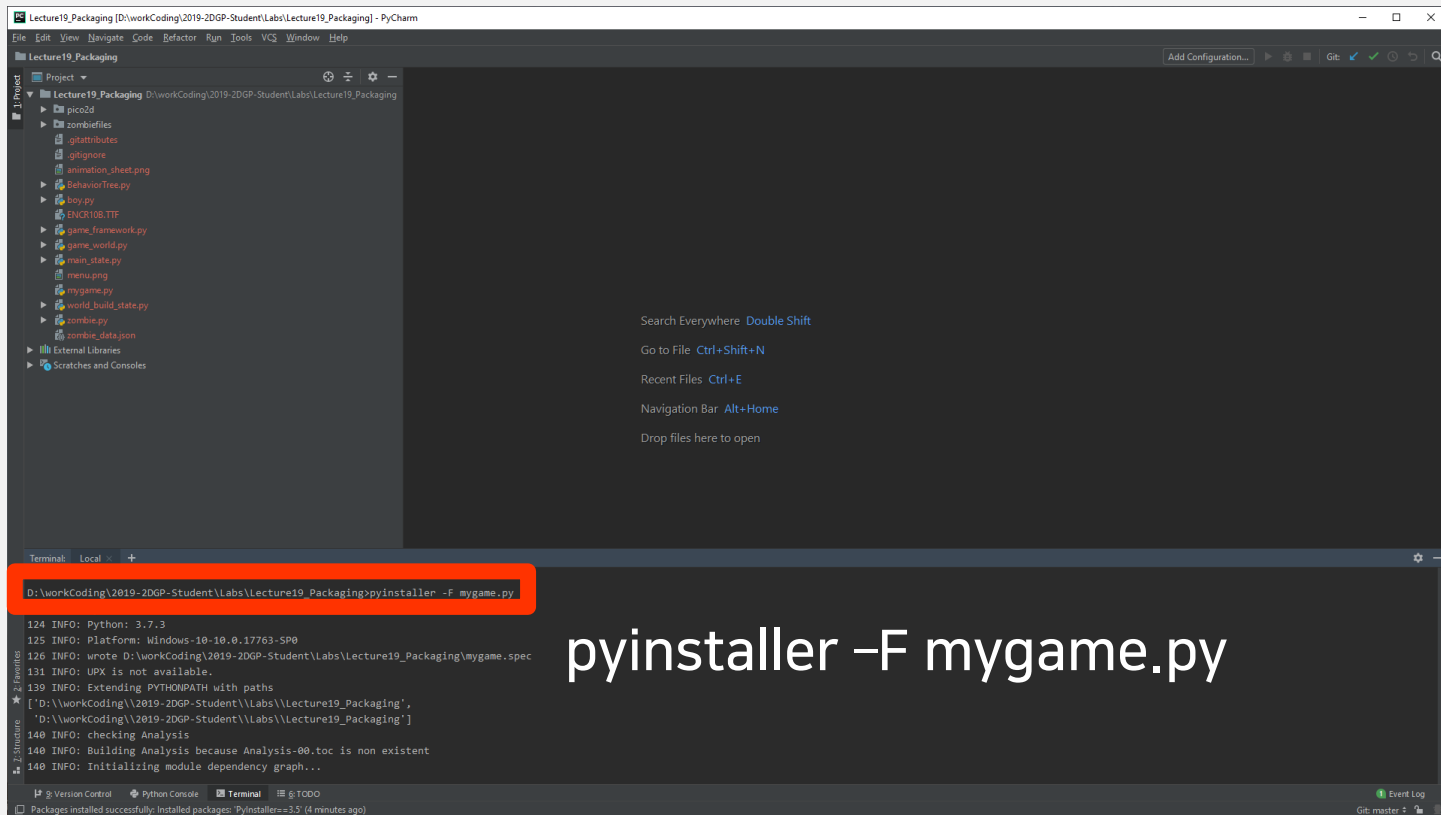
# PyCharm: PyInstaller 설치 확인



# 현재 폴더 터미널 열기



# Pyinstaller 실행



pyinstaller -F mygame.py

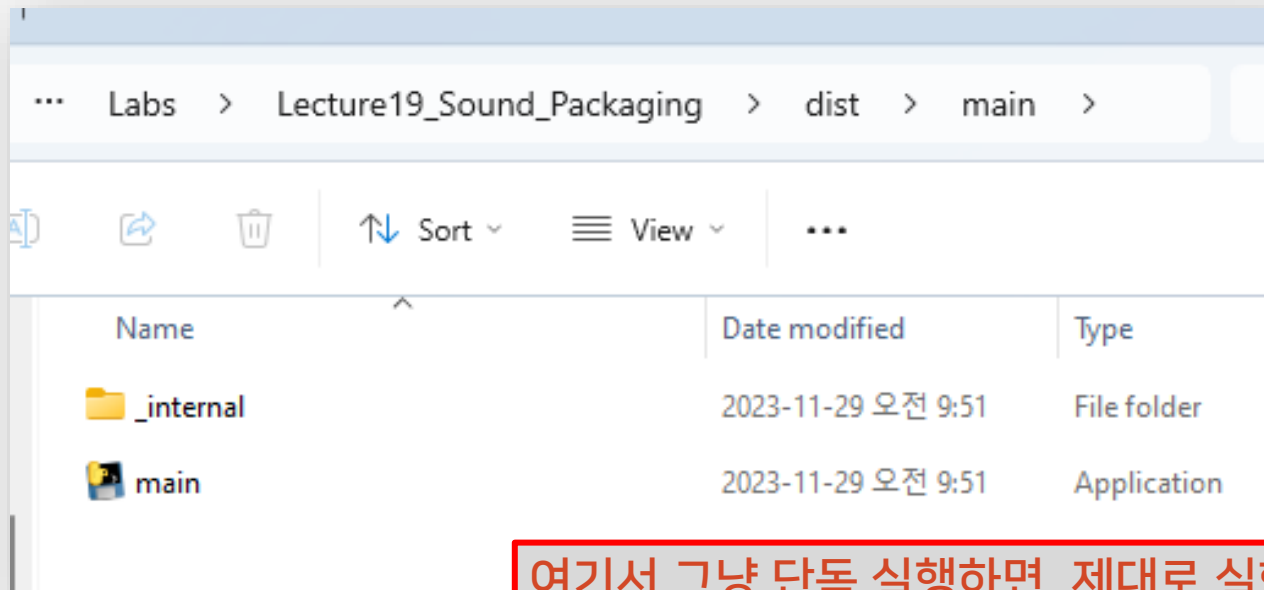
# 성공 확인

Terminal: Local × +

```
7842 INFO: Building PYZ (ZlibArchive) D:\workCoding\2019-2DGP-Student\Labs\Lecture19_Packaging\build\mygame\PYZ-00.pyz completed successfully.
7855 INFO: checking PKG
7856 INFO: Building PKG because PKG-00.toc is non existent
7856 INFO: Building PKG (CArchive) PKG-00.pkg
10303 INFO: Building PKG (CArchive) PKG-00.pkg completed successfully.
10309 INFO: Bootloader c:\python37\lib\site-packages\PyInstaller\bootloader\Windows-64bit\run.exe
10310 INFO: checking EXE
10310 INFO: Building EXE because EXE-00.toc is non existent
10311 INFO: Building EXE from EXE-00.toc
10312 INFO: Appending archive to EXE D:\workCoding\2019-2DGP-Student\Labs\Lecture19_Packaging\dist\mygame.exe
10399 INFO: Building EXE from EXE-00.toc completed successfully.
```

D:\workCoding\2019-2DGP-Student\Labs\Lecture19\_Packaging>

## dist/main 폴더에 만들어진, main.exe



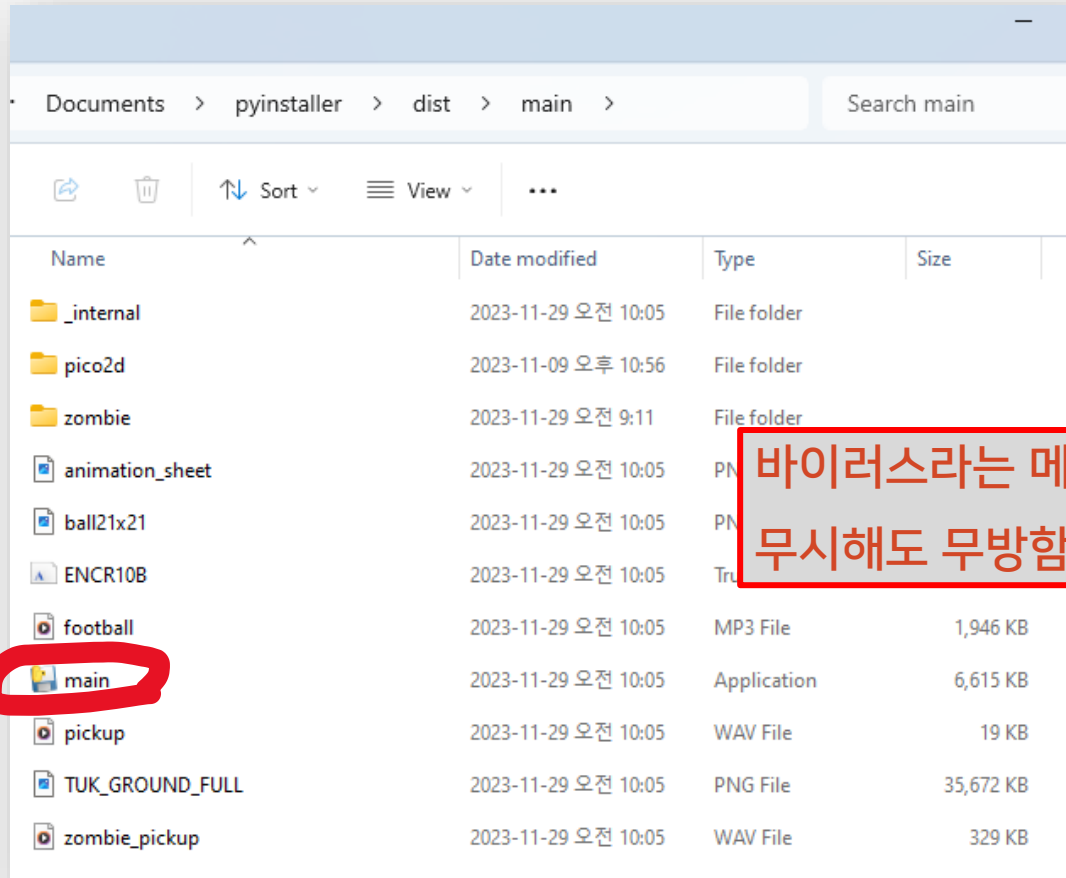
여기서 그냥 단독 실행하면, 제대로 실행이 되지 않음.  
main.exe가 필요로 하는 외부 파일을 찾을 수 없기 때문.

# 리소스 및 필요 DLL 을 dist 폴더로 복사해야 함.

---

- Pico2d SDL 라이브러리 파일
- 게임에 따라 필요한 리소스 파일
  - 현재 실습 파일의 경우,
    - 폰트 - ENCR10B.TTF
    - 메뉴 이미지 - menu.png
    - 애니메이션 스프라이트 이미지 - animation\_sheet.png
    - 좀비 데이터 JSON 파일 - zombie\_data.json
    - 사운드 파일 - football.mp3, pickup.wav

# dist 폴더: 여기서 main.exe 을 클릭하면 실행!



바이러스라는 메시지가 나올 수 있음. !!!!  
무시해도 무방함.



# 빌드 과정 단순화 – run\_pyinstaller.py 실행

## ▪ pyinstaller\_settings.toml

# 메인 파일 이름을 지정하세요.

```
main_file = 'main.py'
```

# 데이터 파일들을 지정하세요.

```
data_files = [  
    'football.mp3', 'zombie_pickup.wav', 'pickup.wav',  
    'animation_sheet.png', 'ball21x21.png', 'TUK_GROUND_FULL.png',  
    'ENCR10B.TTF'  
]
```

# 데이터가 들어있는 폴더들을 지정하세요.

```
data_folders = [  
    'zombie'  
]
```



Installer를 이용한  
설치 파일 제작

# Inno Setup 의 설치

visitors since  
Jan. 1998

- 6.1: Support for downloading files without using a third-party tool and easily [showing the download progress](#) to the user.
- 6.1: Support for per-user fonts if Setup is running on Windows 10 Version 1803 and later.
- 6.2: Graphics modernized, including the automatic use of higher quality images (which were not available before) on higher DPI settings.

**OS requirements change:** Windows 2000, XP, and Server 2003 are no longer supported. Windows Vista is the minimum supported operating system.

**Change in default behavior:** Starting with Inno Setup 6.1 the [Setup] section directive `MinVersion` defaults to `6.1sp1`, so **by default Setup will not run on Windows Vista** or on versions of Windows 7 and Windows Server 2008 R2 which have not been updated. Setting `MinVersion` to `6.0` to allow Setup to run on Windows Vista is supported but not recommended: Windows Vista doesn't support some of Setup's security measures against potential DLL preloading attacks so these have to be removed by the compiler if `MinVersion` is below `6.1` making your installer less secure on all versions of Windows.

**Change in default behavior:** Starting with Inno Setup 6 there's only one version available: Unicode Inno Setup. Unicode Inno Setup has been available for since 2009 but in case you have not yet updated to it: please see the [Unicode Inno Setup](#) topic in the help file for more information. Basically, unless you're using [Code] to make DLL calls with string parameters you shouldn't have to make any changes to your script.

What's new in this version?

Filename	Download Sites	Downloads	Date	Description
innosetup-6.2.1.exe	<a href="#">Random site</a> <a href="#">US</a> <a href="#">Netherlands</a>	538,291	2022-04-14	Unicode Inno Setup <b>self-installing package</b> .

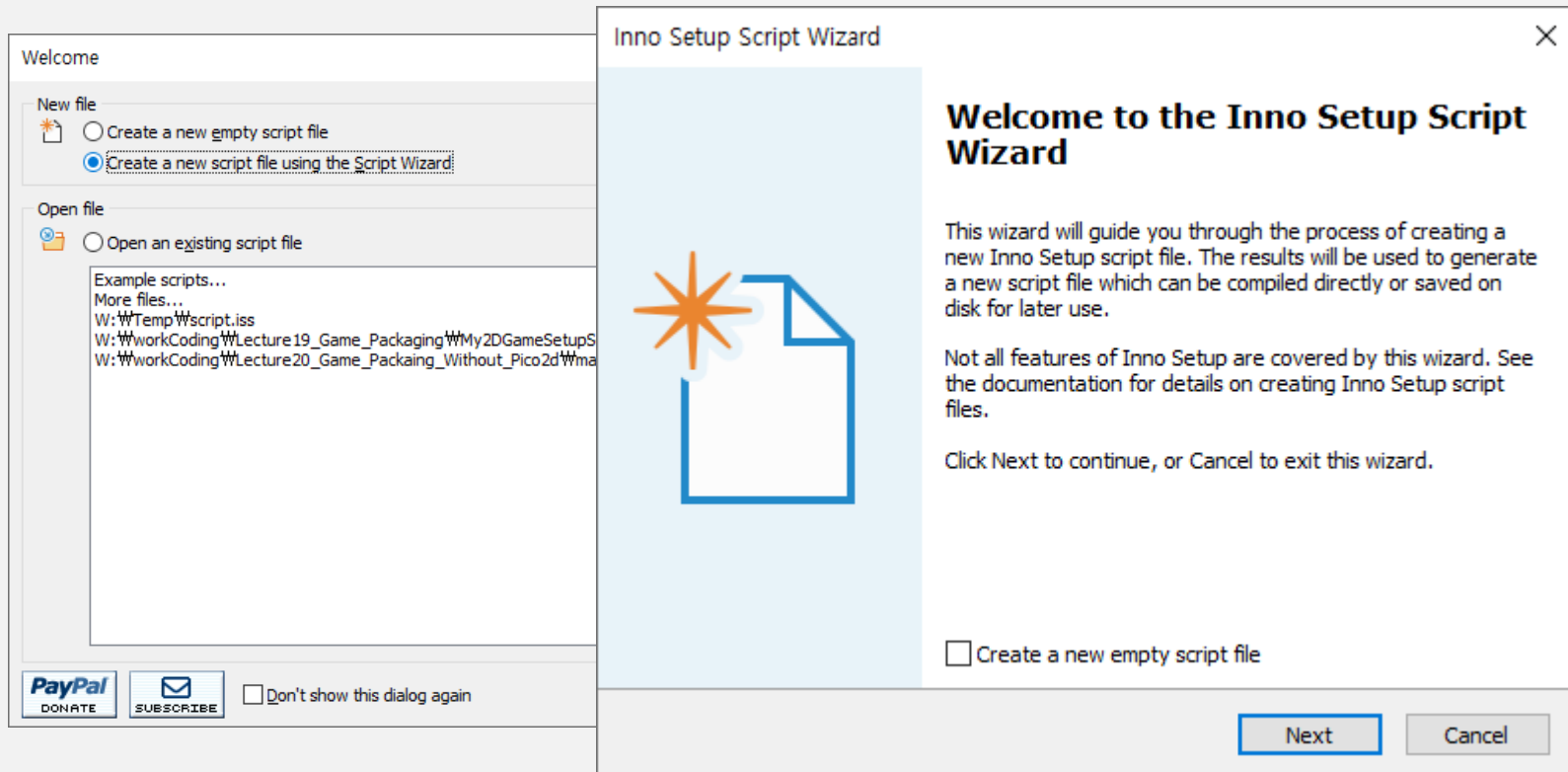
Setup into other languages.

## Encryption Module

For legal reasons, encryption code is not built into Inno Setup. You must download a separate "encryption module" if you wish to utilize Inno Setup's encryption capabilities (that is, the `Encryption` [Setup] section directive). Note: The installer above can download and install it for you.

Filename	Download Sites	Downloads	Size	Description
ISCrypt.dll	<a href="#">Netherlands</a>	1,435,020	2.5 KB	Encryption module for Inno Setup. To install, simply place the file in your Inno Setup directory. <b>sha256 hash:</b> 2f6294f9aa09f59a574b5dcd33be54e16b39377984f3d5658cda44950fa0f8fc
ISCrypt.zip	<a href="#">Netherlands</a>	392,692	2 KB	Source code for the encryption module. <b>sha256 hash:</b> 0569ffe1677ba699d07063a902d48c2f92c8e88669bdc13118f5808c30e998bc

# 실행: File->New



Inno Setup Script Wizard

**Application Information**  
Please specify some basic information about your application.

**Application name:**  
MyGame

**Application version:**  
1.5

Application publisher:  
My Company, Inc.

Application website:  
<https://www.example.com/>

**bold = required**

Inno Setup Script Wizard

**Application Folder**  
Please specify folder information about your application.

**Application destination base folder:**  
Program Files folder

**Application folder name:**  
MyGame

☒ Allow user to change the application folder

☐ The application doesn't need a folder

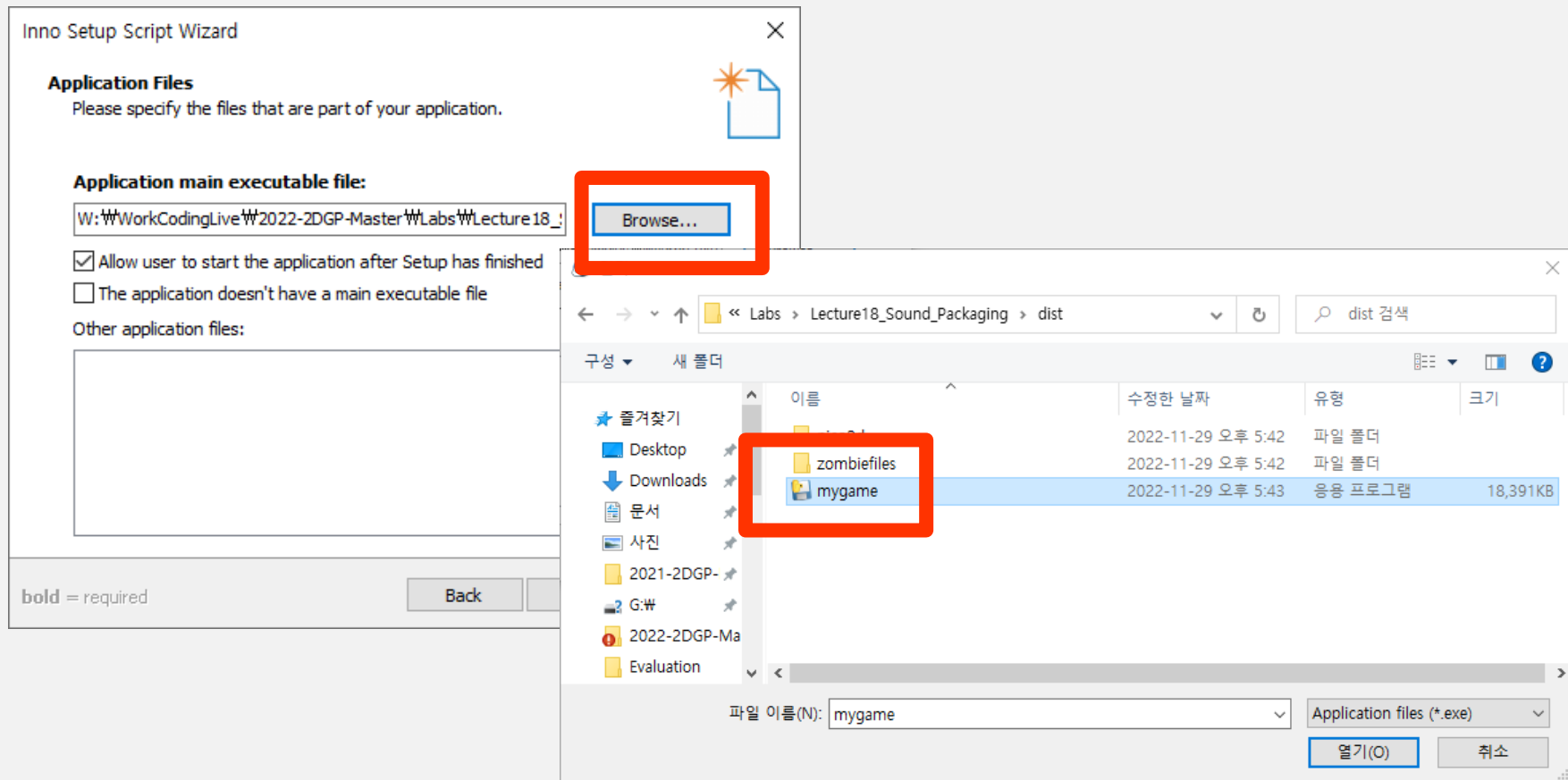
**bold = required**

Back Next Cancel

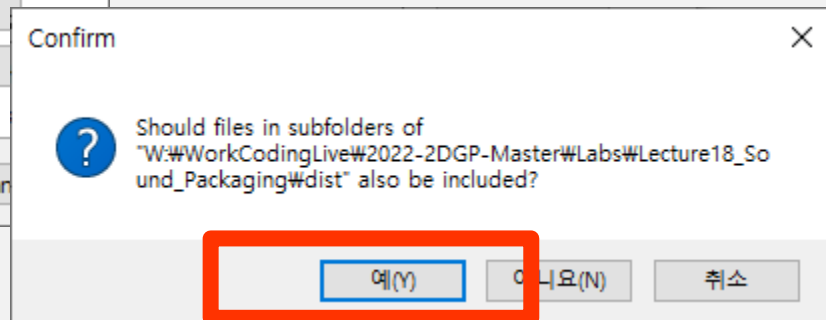
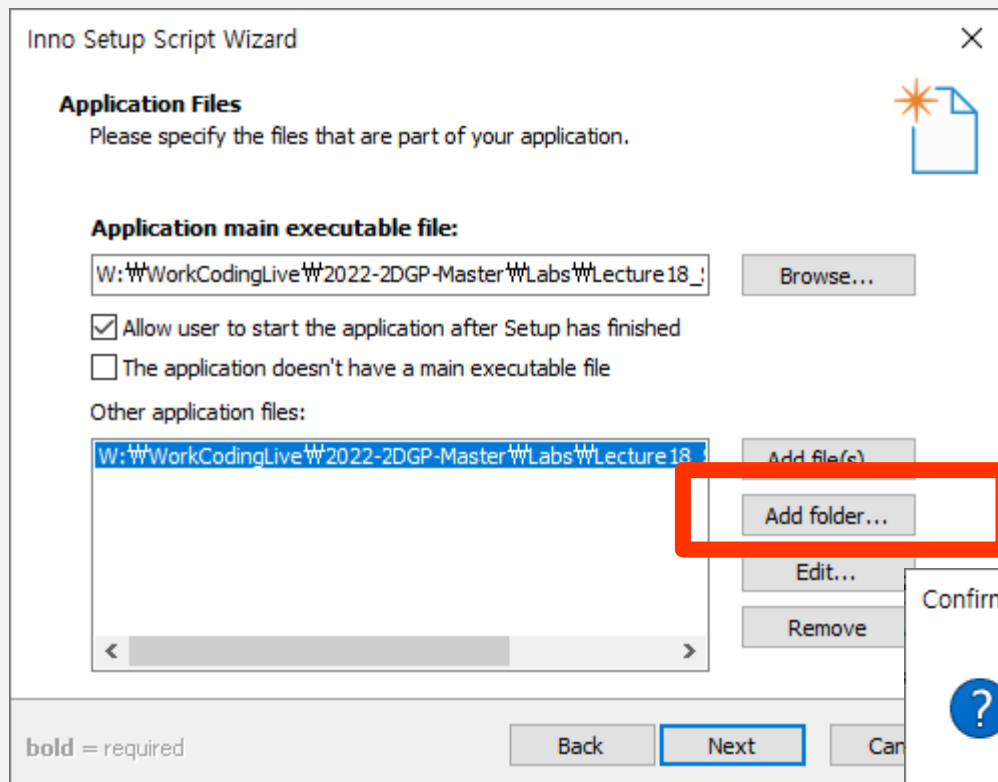
프로그램이 설치될 폴더.

프로젝트 발표를 위해서, 학번으로 구별하는 것이 좋음.

# 실행 파일 추가



# 파일 폴더 추가



## Inno Setup Script Wizard

### Application File Association

Please specify which file association should be created for your application.

☐ Associate a file type

Application file type name:

MyGame File

Application file type extension:

.myp

**bold** = required

## Inno Setup Script Wizard

### Application Shortcuts

Please specify which shortcuts should be created

☒ Create a shortcut to the main executable in the Start Menu

Application Start Menu folder name:

MyGame

☒ Allow user to change the Start Menu folder name

☐ Allow user to disable Start Menu folder creation

☐ Create an Internet shortcut in the Start Menu

☐ Create an Uninstall shortcut in the Start Menu

Other shortcuts to the main executable:

☒ Allow user to create a desktop shortcut

**bold** = required

Back

Next

Cancel

## Inno Setup Script Wizard

### Application Documentation

Please specify which documentation files should be shown by Setup during installation.

License file:

Browse...

Information file shown before installation:

Browse...

Information file shown after installation:

Browse...

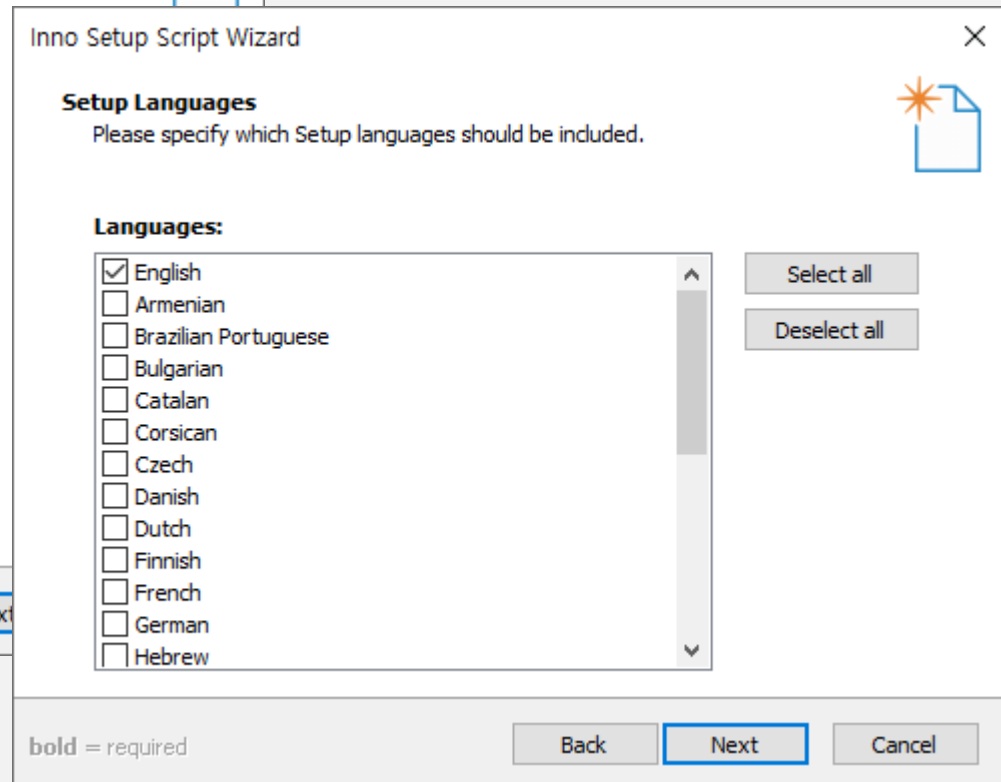
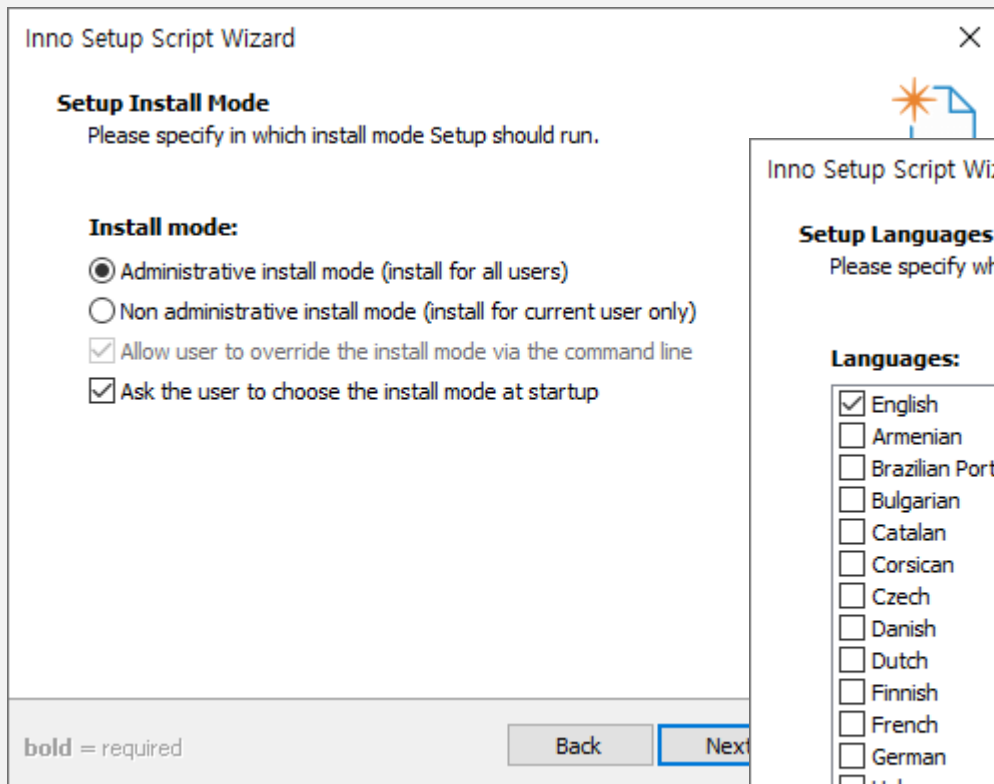
Back

Next

Cancel







Inno Setup Script Wizard

**Compiler Settings**  
Please specify some basic compiler settings.

Custom compiler output folder:

Compiler output base file name:

Custom Setup icon file:

Setup password:

Back

Inno Setup Script Wizard

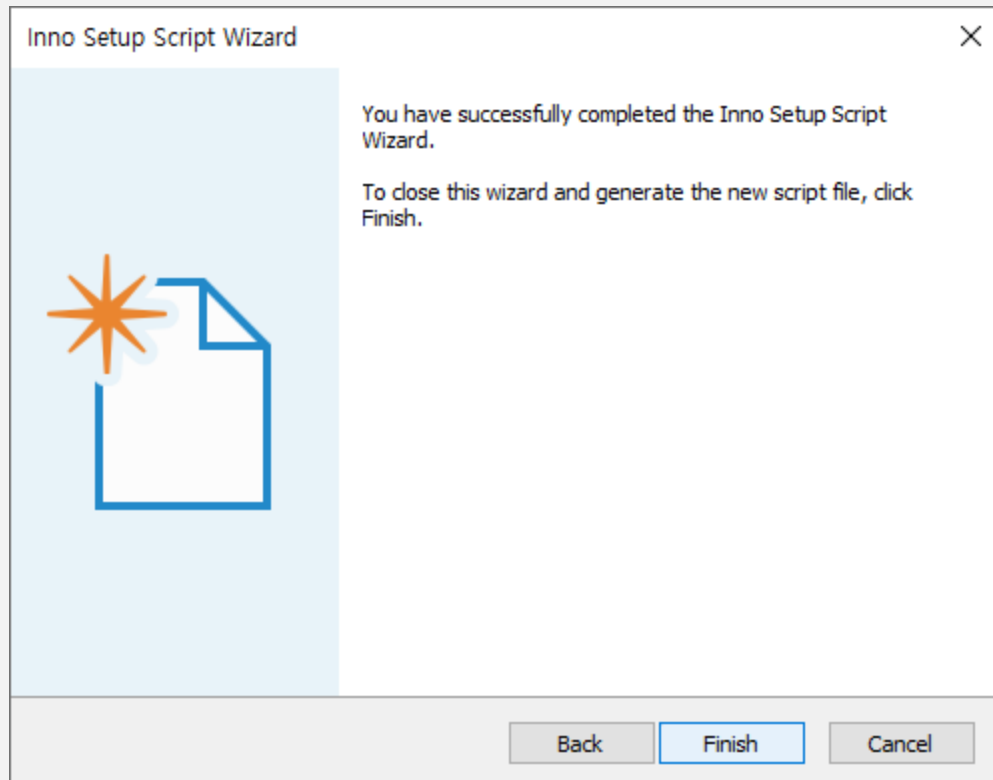
**Inno Setup Preprocessor**  
Please specify whether Inno Setup Preprocessor should be used.

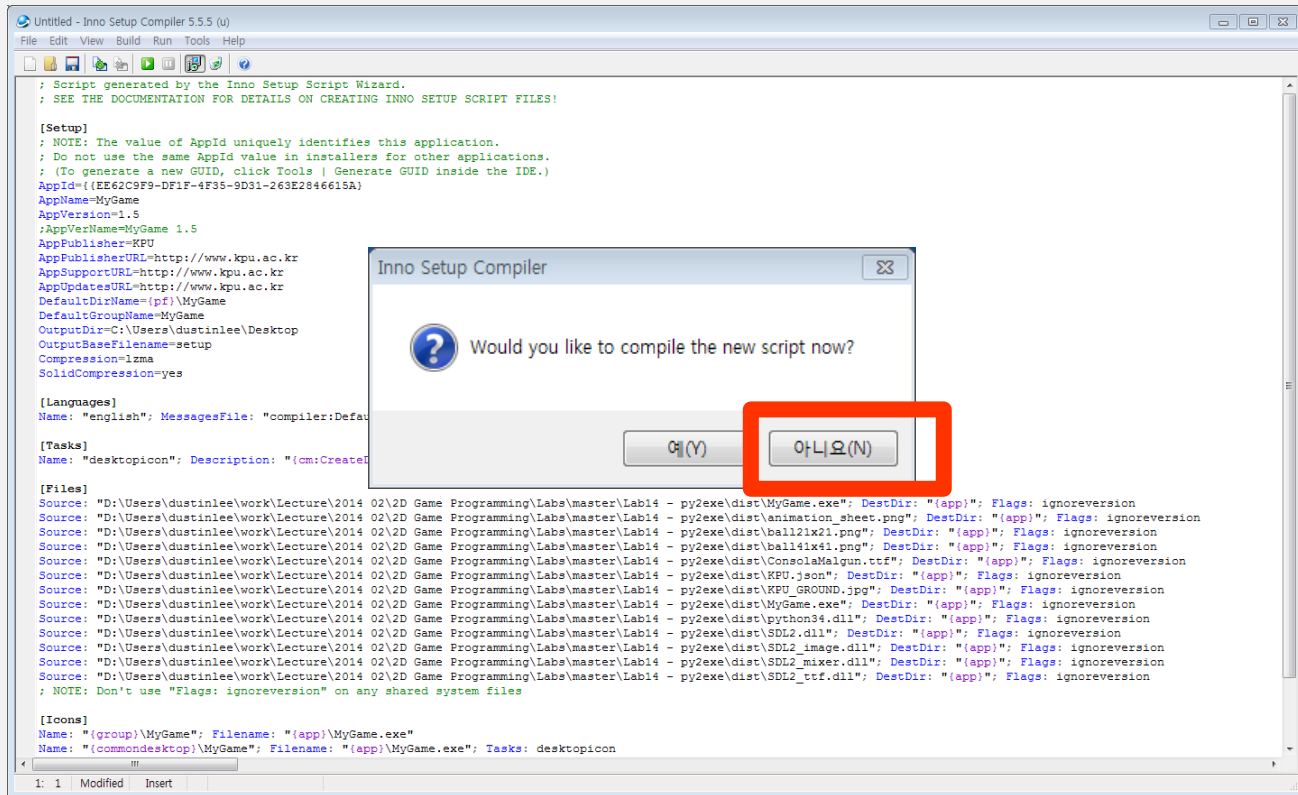
The Inno Setup Script Wizard can use #define compiler directives to simplify your script. Although this is not necessary, it will make it easier to manually change the script later.

Do you want the Inno Setup Script Wizard to use #define compiler directives?

☒ Yes, use #define compiler directives

Back Next Cancel





```
test - Inno Setup Compiler 5.6.1 (u)
File Edit View Build Run Tools Help

[Files]
Source: "D:\workCoding\2DGP-Master\Labs\Lecture18\dist\mygame.exe"; DestDir: "{app}"; FI
Source: "D:\workCoding\2DGP-Master\Labs\Lecture18\dist\*"; DestDir: "{app}"; Permissions
; NOTE: Don't use "Flags: ignoreversion" on any shared system files

[Icons]
Name: "{commonprograms}\My Program"; Filename
Name: "{commondesktop}\My Program"; Filename

[Run]
Filename: "{app}\mygame.exe"; Description: "

[Dirs]
Name: {app}; Permissions: users-full

Compressing: D:\workCoding\2DGP-Master\Labs\Lecture18\dist\Wzor
Compressing: D:\workCoding\2DGP-Master\Labs\Lecture18\dist\Wzor
Compressing: D:\workCoding\2DGP-Master\Labs\Lecture18\dist\Wzor
Compressing: D:\workCoding\2DGP-Master\Labs\Lecture18\dist\Wzor
Compressing: D:\workCoding\2DGP-Master\Labs\Lecture18\dist\Wzor
Compressing Setup program executable
Updating version info

Warning: Setting the [Setup] section "OutputBaseFileName" to "setup" is not recommended. all executables named "setup.exe" are shimmed by Window

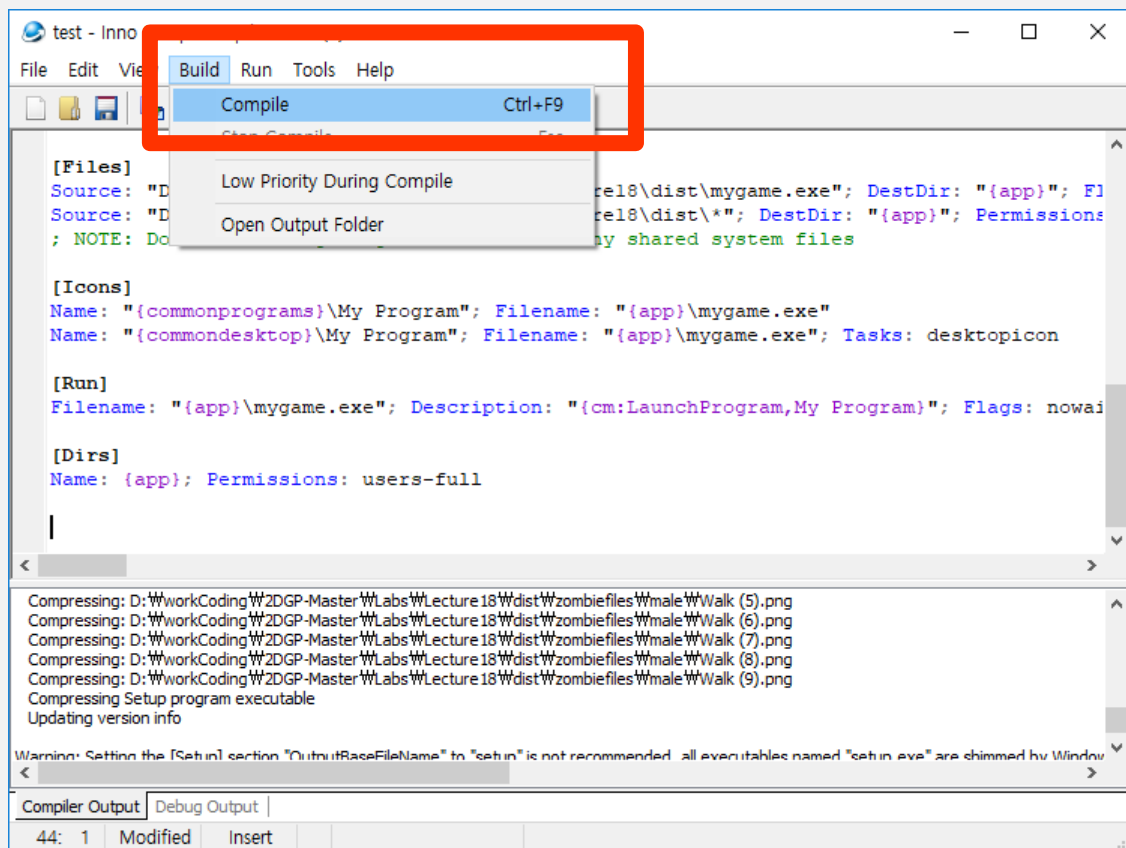
Compiler Output | Debug Output |
44: 1 | Modified | Insert
```

game.save 처럼 현재 mygame 폴더에 데이터 파일을 써야 하는 경우가 있음.

하지만, 폴더가 Program Files 로써 시스템 폴더이기 때문에, 일반적으로 애플리케이션에서 저장이 불가능.

따라서, 해당 폴더의 permission 을 강제로 풀어야 함.

추천할 만한 방법은 아니며, 사용자 데이터는 사용자의 개별 폴더에 저장할 수 있게 하는 것이 바람직함.



# 생성된 셋업 파일

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