AUTOMATION IS DOCUMENTATION

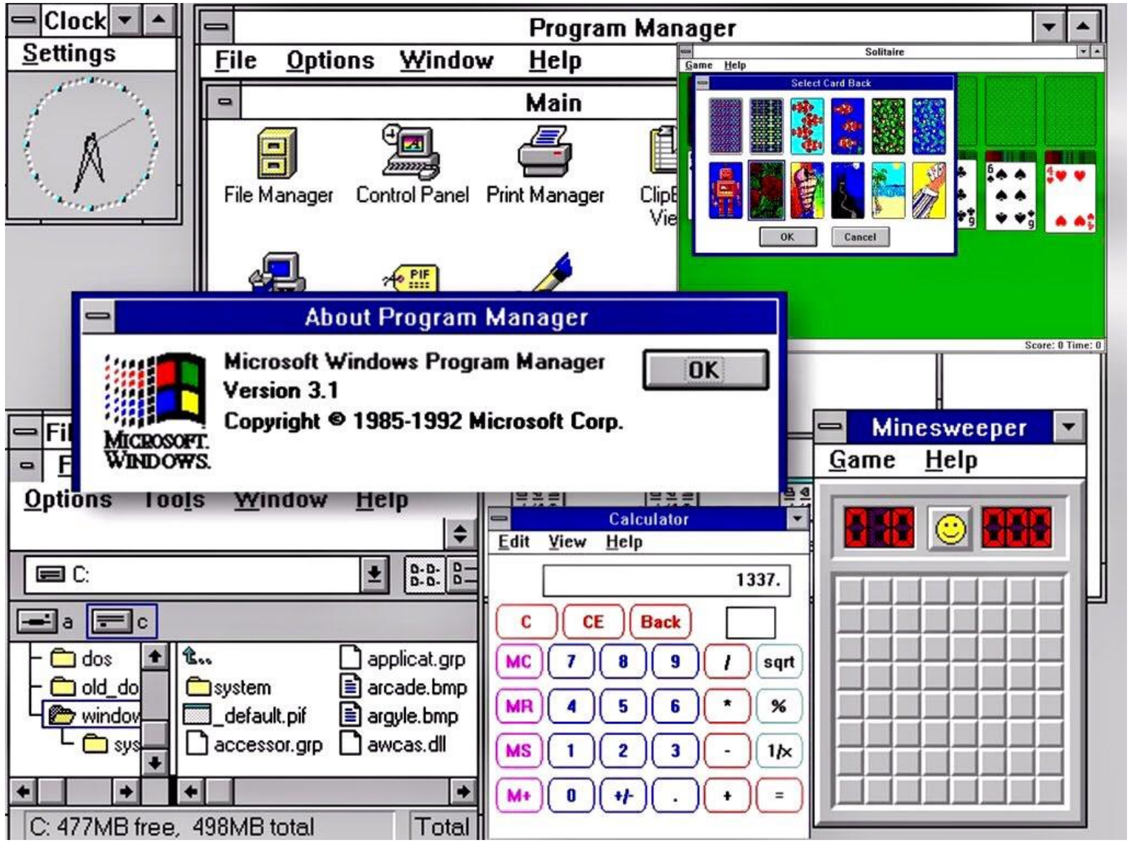
FUNCTIONAL DOCUMENTATION OF HUMAN-MACHINE INTERACTION FOR FUTURE SOFTWARE RE-USE

ABOUT MYSELF

- Jurek Oberhauser
- Software Developer (and part time researcher) as part of the EaaSI project
- Graduated in Computer Science in October 2021 at the University of Freiburg
- Studied in Edinburgh for one semester

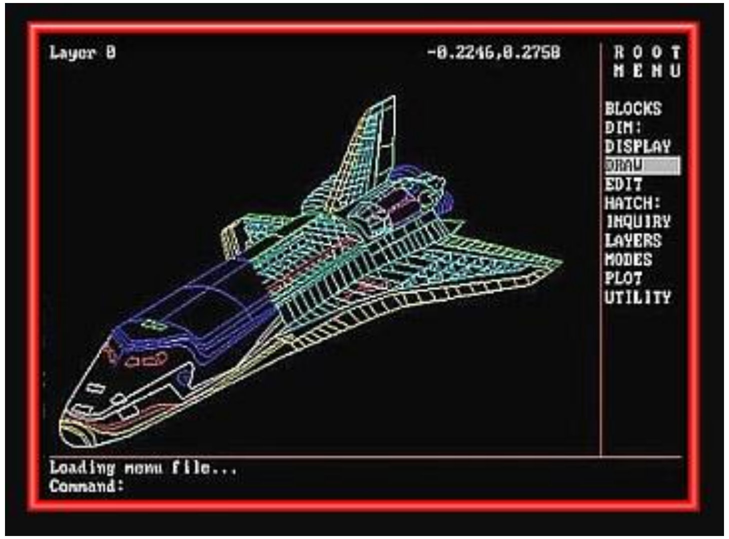
- IDCC 2022 is my first conference!

DO YOU KNOW HOW TO OPERATE THIS?



Microsoft Windows Program Manager
Version 3.1
Copyright © 1985-1992 Microsoft Corp.

C: 477MB free, 498MB total



```
Loading menu file...
Command:
```

???

Preserve operational knowledge through automation of user interactions

AUTOMATING USER INTERACTIONS

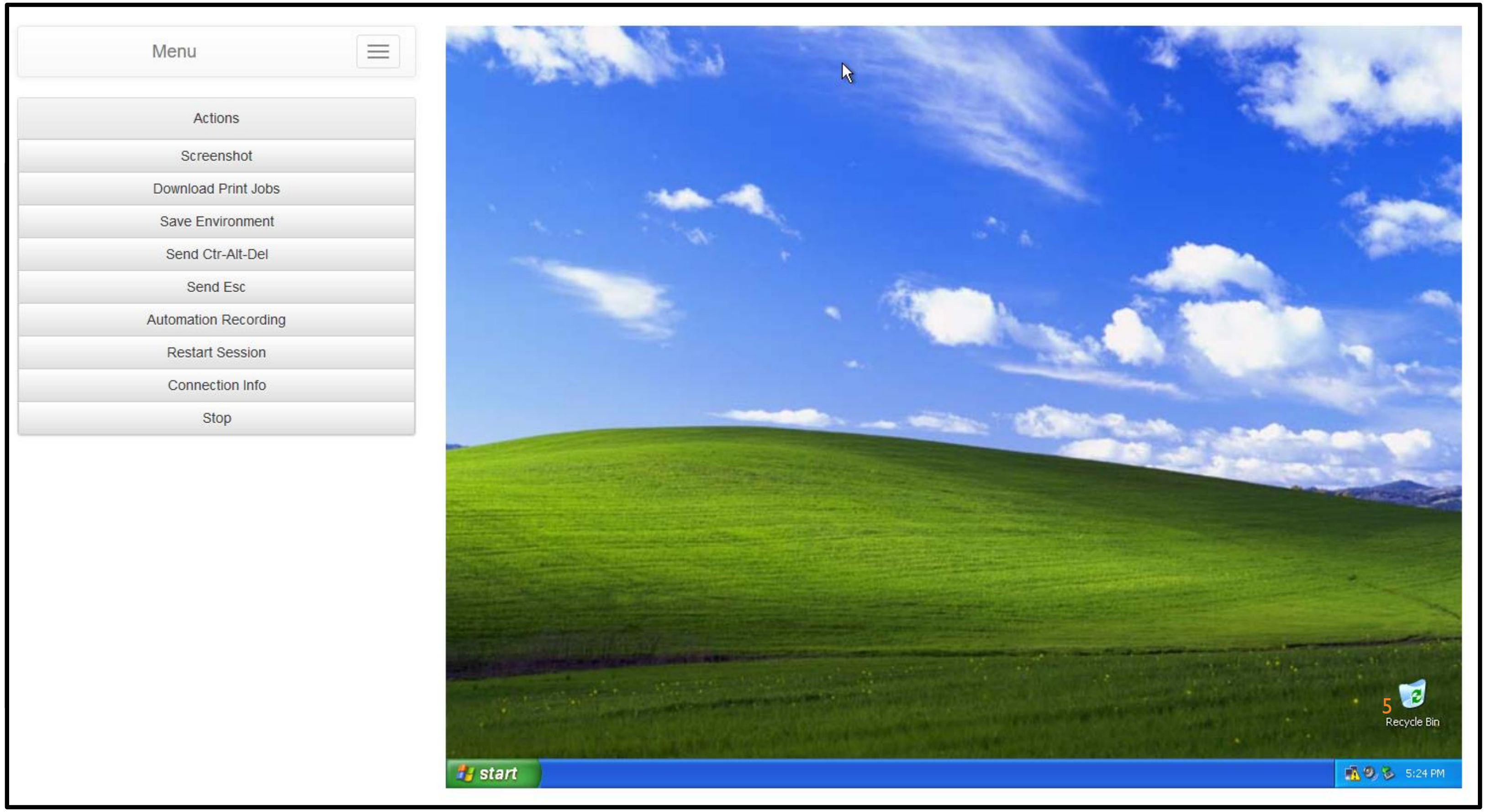
- Overall goal: Software preservation → Software re-use
- Preserve software (using emulation) & Operational knowledge
- Focusing on manual interaction only: Reduced utility of software re-use, does not scale
- Batch processing: Extend the utility of preserved software

- Automation of user interactions allows us to:
  1. Use Software without *using* software
  2. Document software usage patterns
  3. Scale

How can we integrate automation with emulation?

EMULATION-AS-A-SERVICE (EAAS)

- Web-based emulation framework
- Emulation environments
- Access everything in a browser



APPROACH

Overall Goal: Create, describe or capture interactions between humans and computers
Replay interactions in emulation environments

Internal Automation

Approach 1: Interact with software/OS interfaces

Use scripting languages to automate software

External Automation

Approach 2: Interact with **visible** elements of the software's user interface

One example implementation per approach

APPROACH 1: SOFTWARE/OS INTERFACES

- *Internal* Automation: Executed **in** the target system (OS + automation software)
- Need to setup system with the purpose of automation (can’t just execute in any existing environment)
- Many options (macro recorder, automation tools, etc.)
- Tool needs to be well documented
- Tasks can be generated or modified outside the emulation environment (*inject* before execution)
- System provides “guarantees” about the outcome of the automation task: Deterministic

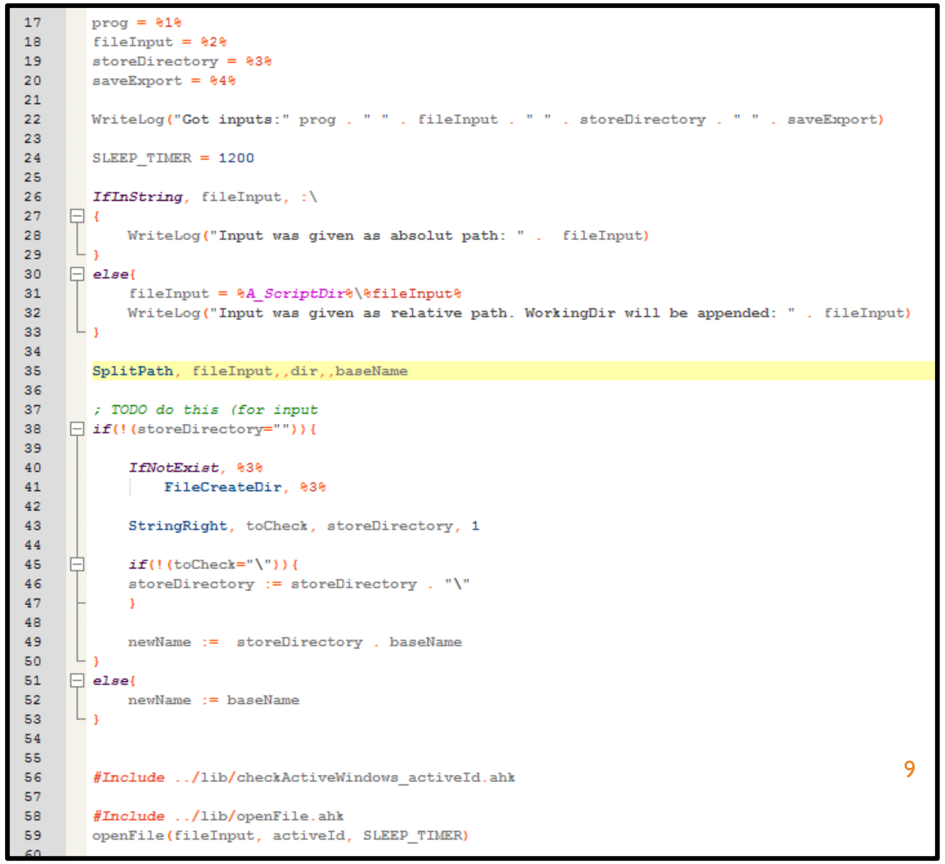
APPROACH 1: REUSABILITY?

- Automation script = certain knowledge/documentation: 1. Text (script) form, 2. Executable form
  → apply to similar use-cases → efficient re-use
- Examples: Autologin, IP/networking config, printer setup, language settings, basic OS settings, run a software, open a file, save a file, copy-paste, etc.
- "Mix-and-match" for more complex workflows
- Eventually AI can use library to automatically setup tasks

APPROACH 1: SOFTWARE/OS INTERFACES

- Example Implementation: AutoHotKey
- Automation scripts for specified tasks
- Windows only (95-11)
- Other OS would require a similar solution

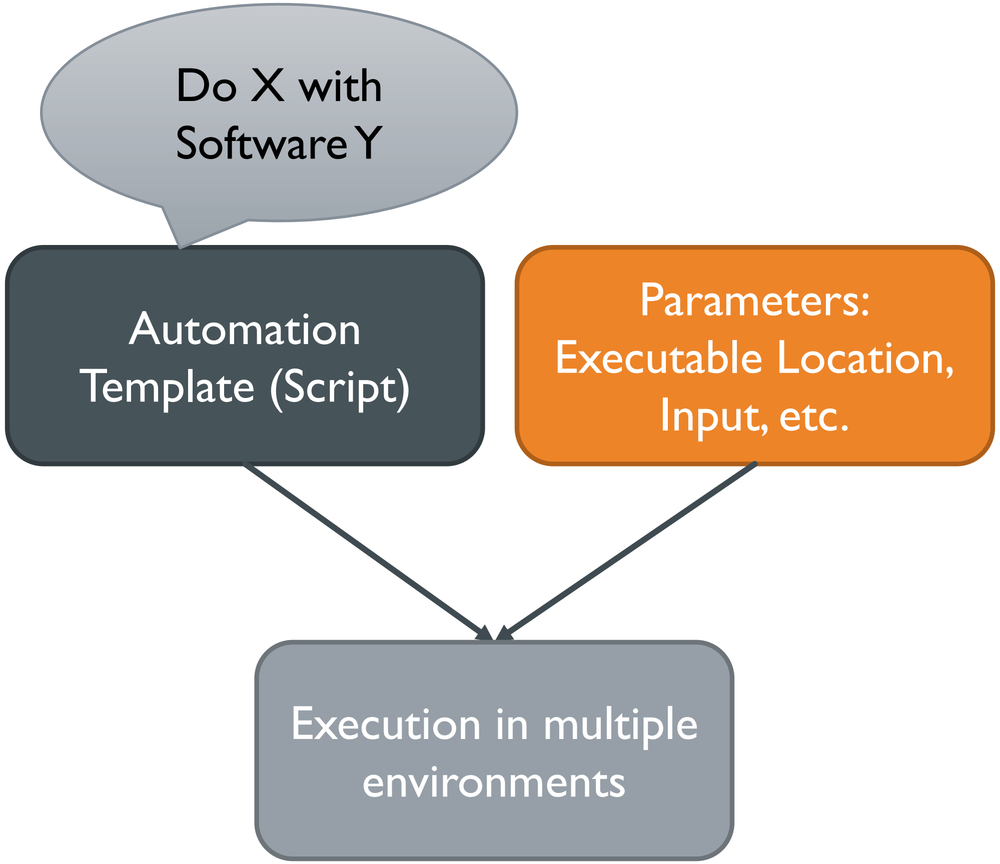
- Can we use the same script for different software (albeit with similar features)?



```
prog = %1%
fileInput = %2%
storeDirectory = %3%
saveExport = %4%

WriteLog("Got inputs:" prog . " " . fileInput . " " . storeDirectory . " " . saveExport)

SLEEP_TIMER = 1200

IfInString, fileInput, :\
{
    WriteLog("Input was given as absolut path: " .  fileInput)
}
else{
    fileInput = %A_ScriptDir%\%fileInput%
    WriteLog("Input was given as relative path. WorkingDir will be appended: " . fileInput)
}

SplitPath, fileInput,,dir,,baseName

; TODO do this (for input
if(!(storeDirectory="")){

    IfNotExist, %3%
        FileCreateDir, %3%

    StringRight, toCheck, storeDirectory, 1

    if(!(toCheck="\")){
    storeDirectory := storeDirectory . "\"
    }

    newName :=  storeDirectory . baseName
}
else{
    newName := baseName
}


#Include ../lib/checkActiveWindows_activeId.ahk

#Include ../lib/openFile.ahk
openFile(fileInput, activeId, SLEEP_TIMER)
```

APPROACH 1: AUTOMATION TEMPLATING

- 1 Task
- Targets different software
- Can be executed in multiple environments



Do X with Software Y

Automation Template (Script)

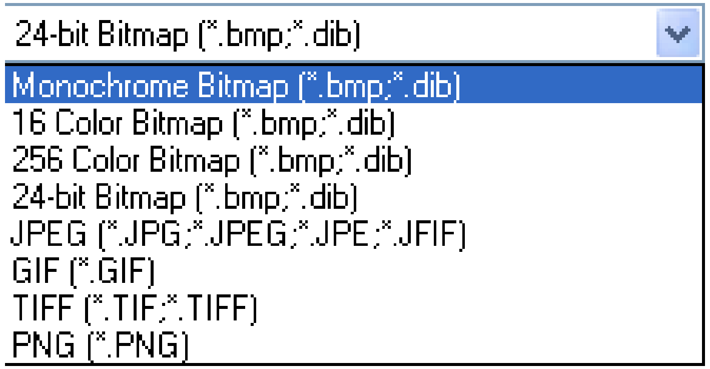
Parameters: Executable Location, Input, etc.

Execution in multiple environments

APPROACH 1: EXAMPLES

- **File Creation:** Create all possible output files (one of each file type)
- **File Type Information:** Store all possible output file types in a text file
- **File Migration:** "Migrate" input files to a specified file type

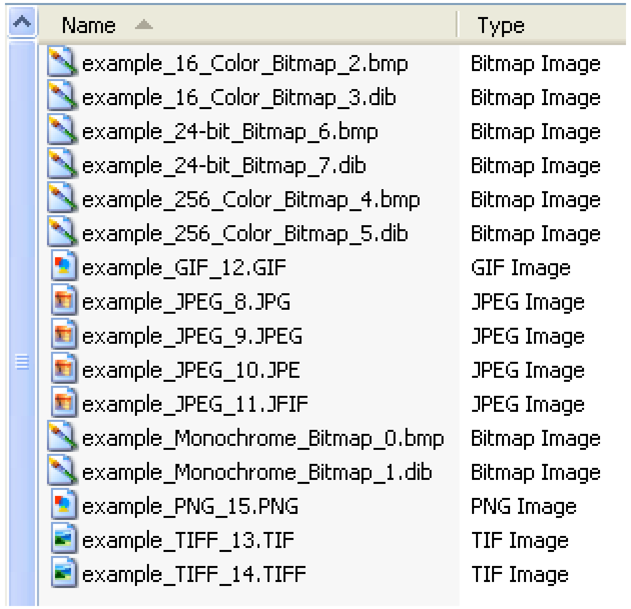
MS Paint 'Save As' Menu



24-bit Bitmap (*.bmp;*.dib)

Monochrome Bitmap (*.bmp;*.dib)
16 Color Bitmap (*.bmp;*.dib)
256 Color Bitmap (*.bmp;*.dib)
24-bit Bitmap (*.bmp;*.dib)
JPEG (*.JPG;*.JPEG;*.JPE;*.JFIF)
GIF (*.GIF)
TIFF (*.TIF;*.TIFF)
PNG (*.PNG)

File Creation:



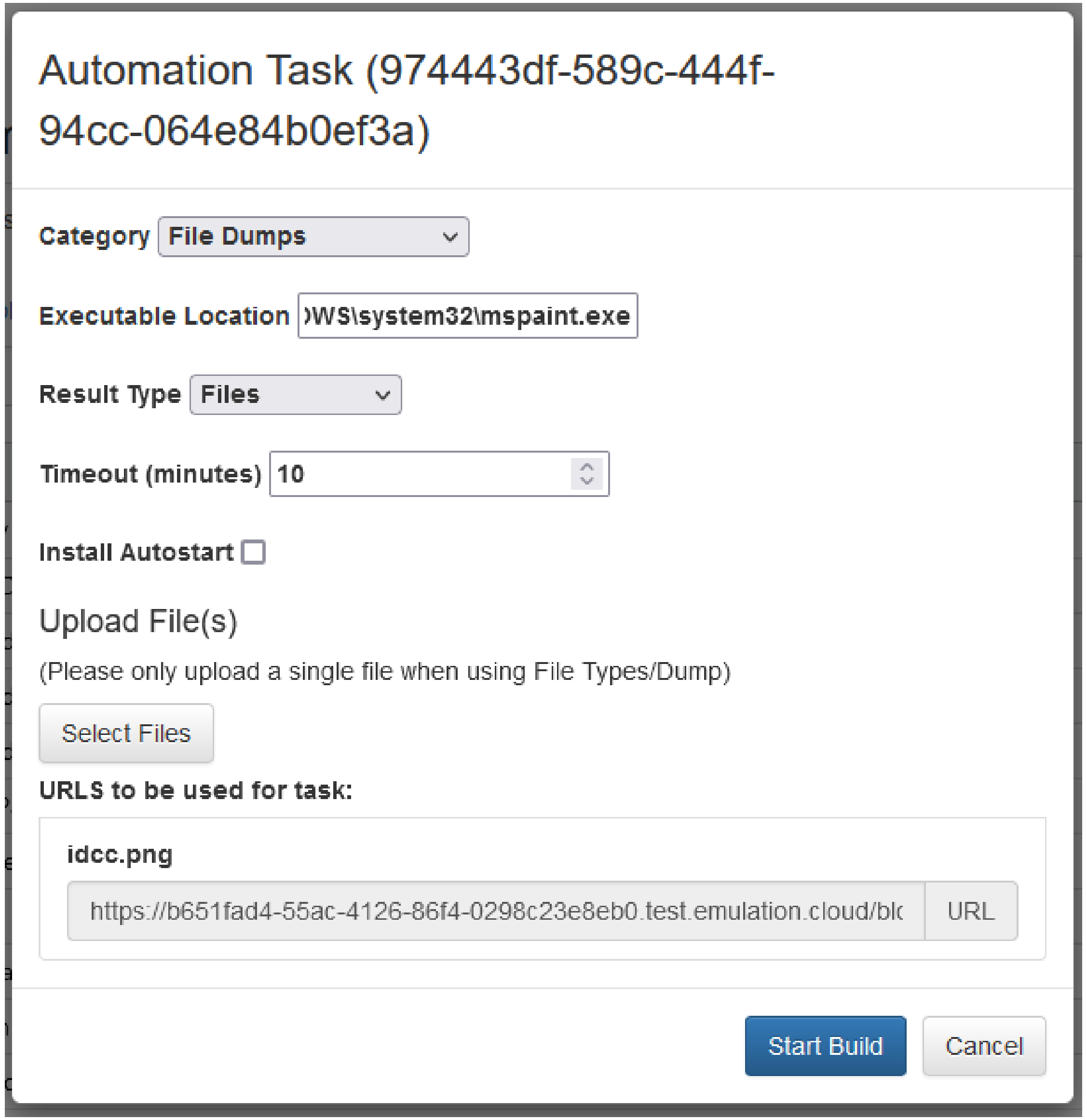
Name	Type
example_16_Color_Bitmap_2.bmp	Bitmap Image
example_16_Color_Bitmap_3.dib	Bitmap Image
example_24-bit_Bitmap_6.bmp	Bitmap Image
example_24-bit_Bitmap_7.dib	Bitmap Image
example_256_Color_Bitmap_4.bmp	Bitmap Image
example_256_Color_Bitmap_5.dib	Bitmap Image
example_GIF_12.GIF	GIF Image
example_JPEG_8.JPG	JPEG Image
example_JPEG_9.JPEG	JPEG Image
example_JPEG_10.JPE	JPEG Image
example_JPEG_11.JFIF	JPEG Image
example_Monochrome_Bitmap_0.bmp	Bitmap Image
example_Monochrome_Bitmap_1.dib	Bitmap Image
example_PNG_15.PNG	PNG Image
example_TIFF_13.TIF	TIF Image
example_TIFF_14.TIFF	TIF Image

File Type Information:

all_file_types.txt

Monochrome Bitmap (*.bmp;*.dib)
16 Color Bitmap (*.bmp;*.dib)
256 Color Bitmap (*.bmp;*.dib)
24-bit Bitmap (*.bmp;*.dib)
JPEG (*.JPG;*.JPEG;*.JPE;*.JFIF)
GIF (*.GIF)
TIFF (*.TIF;*.TIFF)
PNG (*.PNG)

EXAMPLE: WINDOWS XP + MS PAINT



Automation Task (974443df-589c-444f-94cc-064e84b0ef3a)

Category: File Dumps

Executable Location:)WS\system32\mspaint.exe

Result Type: Files

Timeout (minutes): 10

Install Autostart □

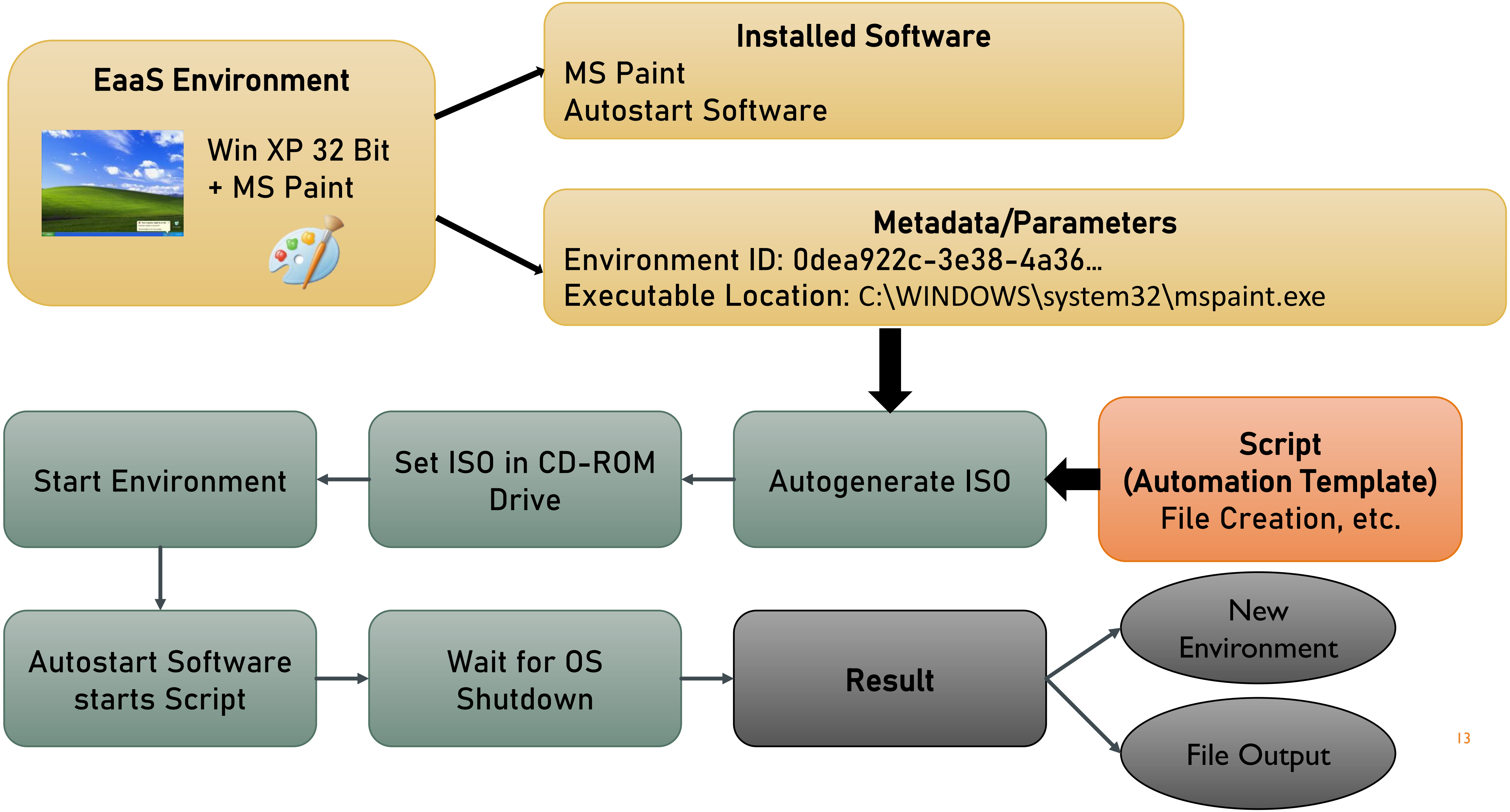
Upload File(s)

(Please only upload a single file when using File Types/Dump)

URLS to be used for task:

idcc.png

https://b651fad4-55ac-4126-86f4-0298c23e8eb0.test.emulation.cloud/blc



EaaS Environment

Win XP 32 Bit
+ MS Paint

Installed Software

MS Paint
Autostart Software

Metadata/Parameters

Environment ID: 0dea922c-3e38-4a36…
Executable Location: C:\WINDOWS\system32\mspaint.exe

Autogenerate ISO

Script
(Automation Template)
File Creation, etc.

Set ISO in CD-ROM Drive

Start Environment

Autostart Software starts Script

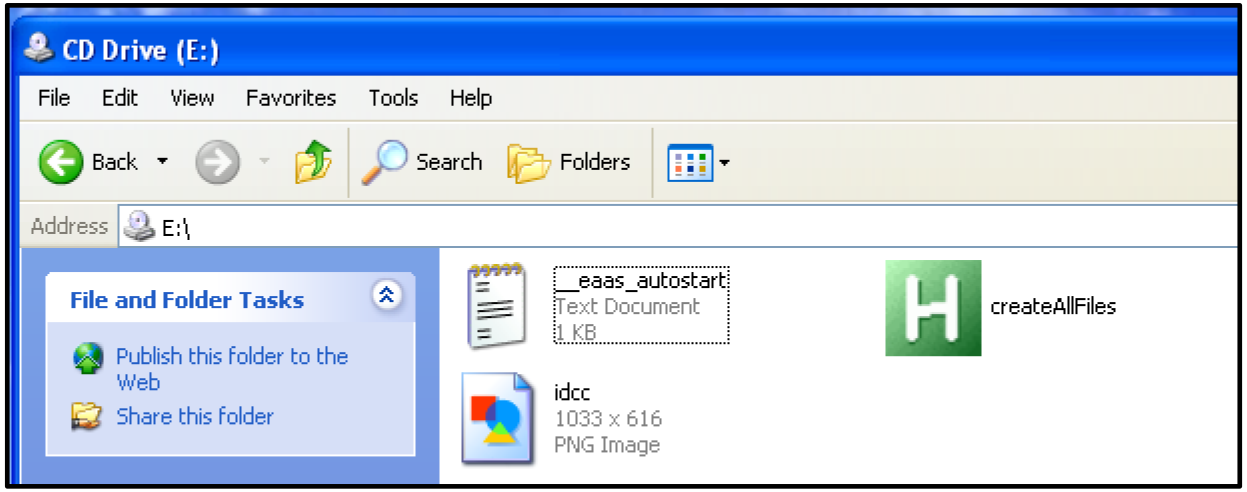
Wait for OS Shutdown

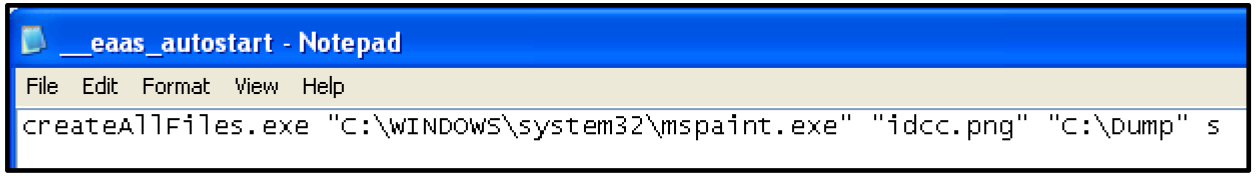
Result

New Environment

File Output

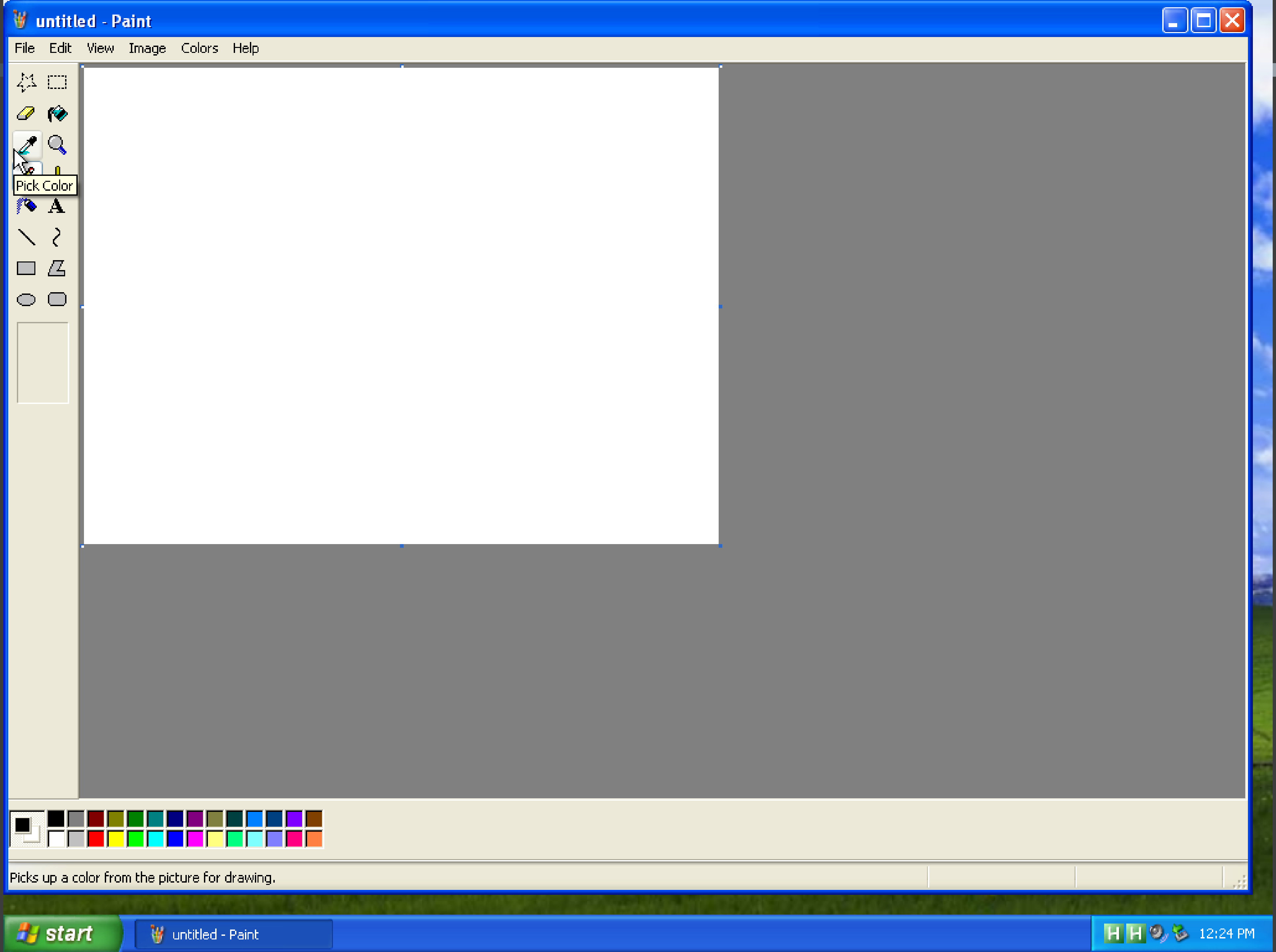
EXAMPLE



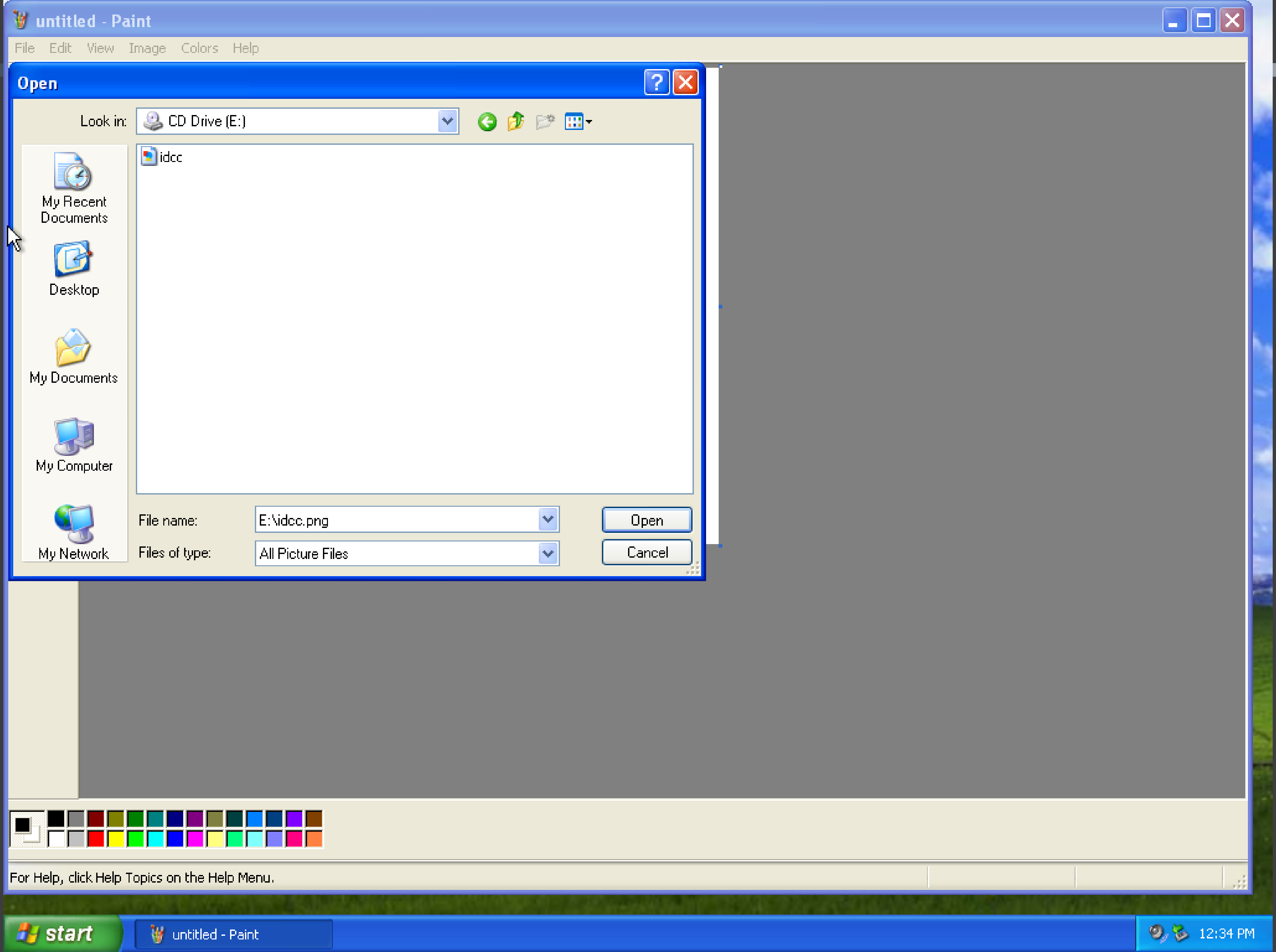


```
createAllFiles.exe "C:\WINDOWS\system32\mspaint.exe" "idcc.png" "C:\Dump" s
```

Recycle Bin
start
12:11 PM



Picks up a color from the picture for drawing.

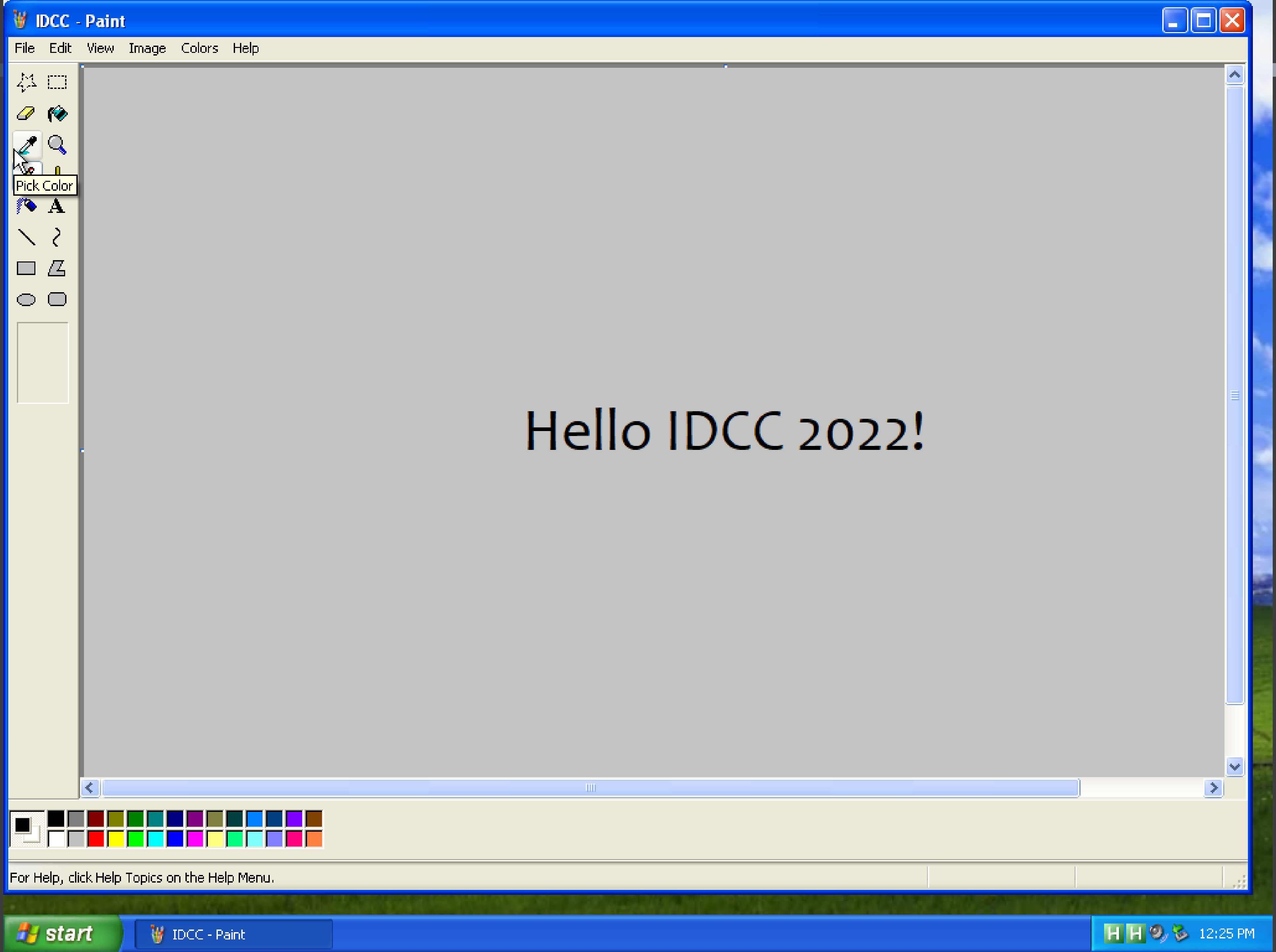


Look in: CD Drive (E:)

File name: E:\idcc.png

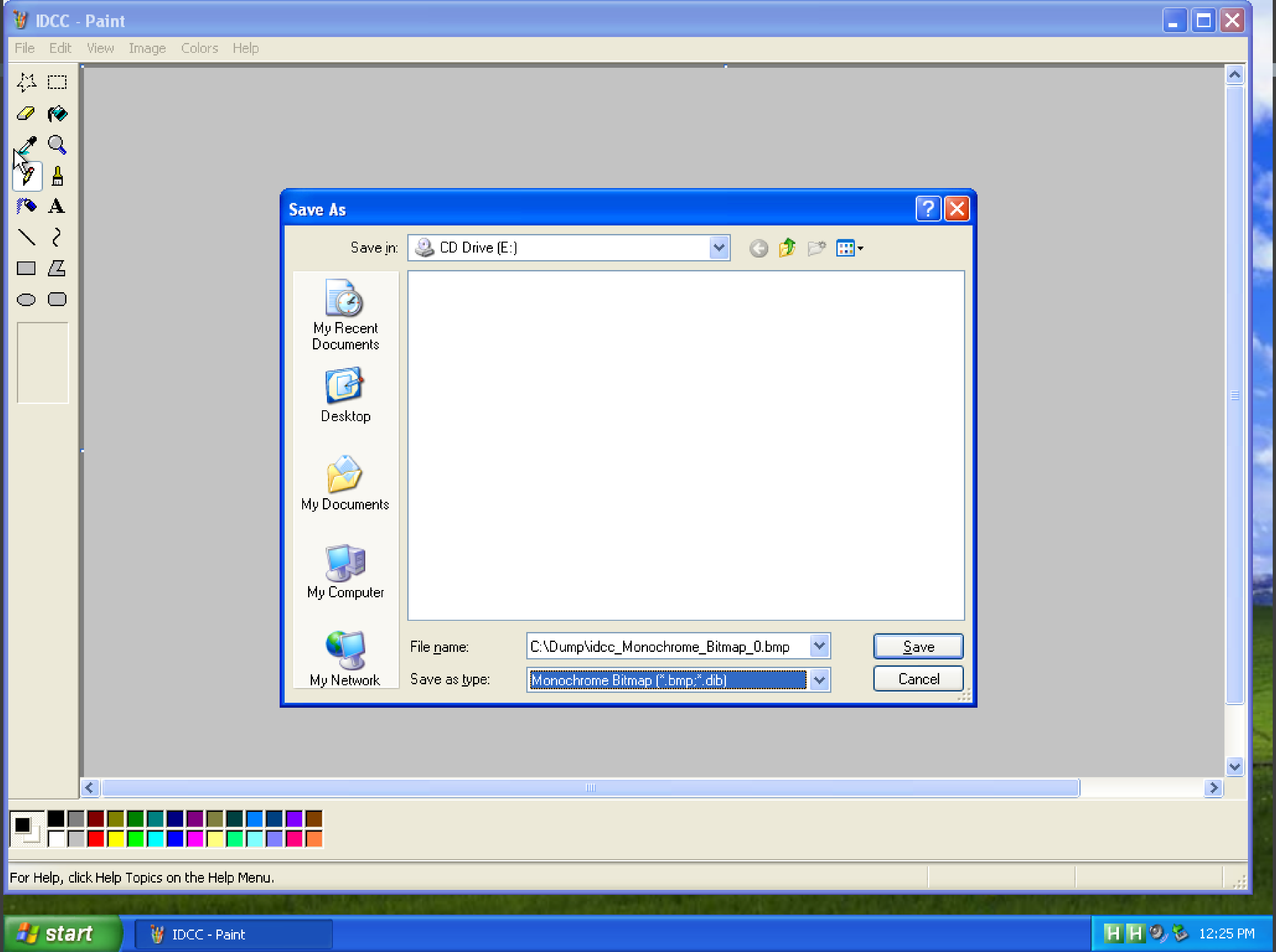
Files of type: All Picture Files

For Help, click Help Topics on the Help Menu.



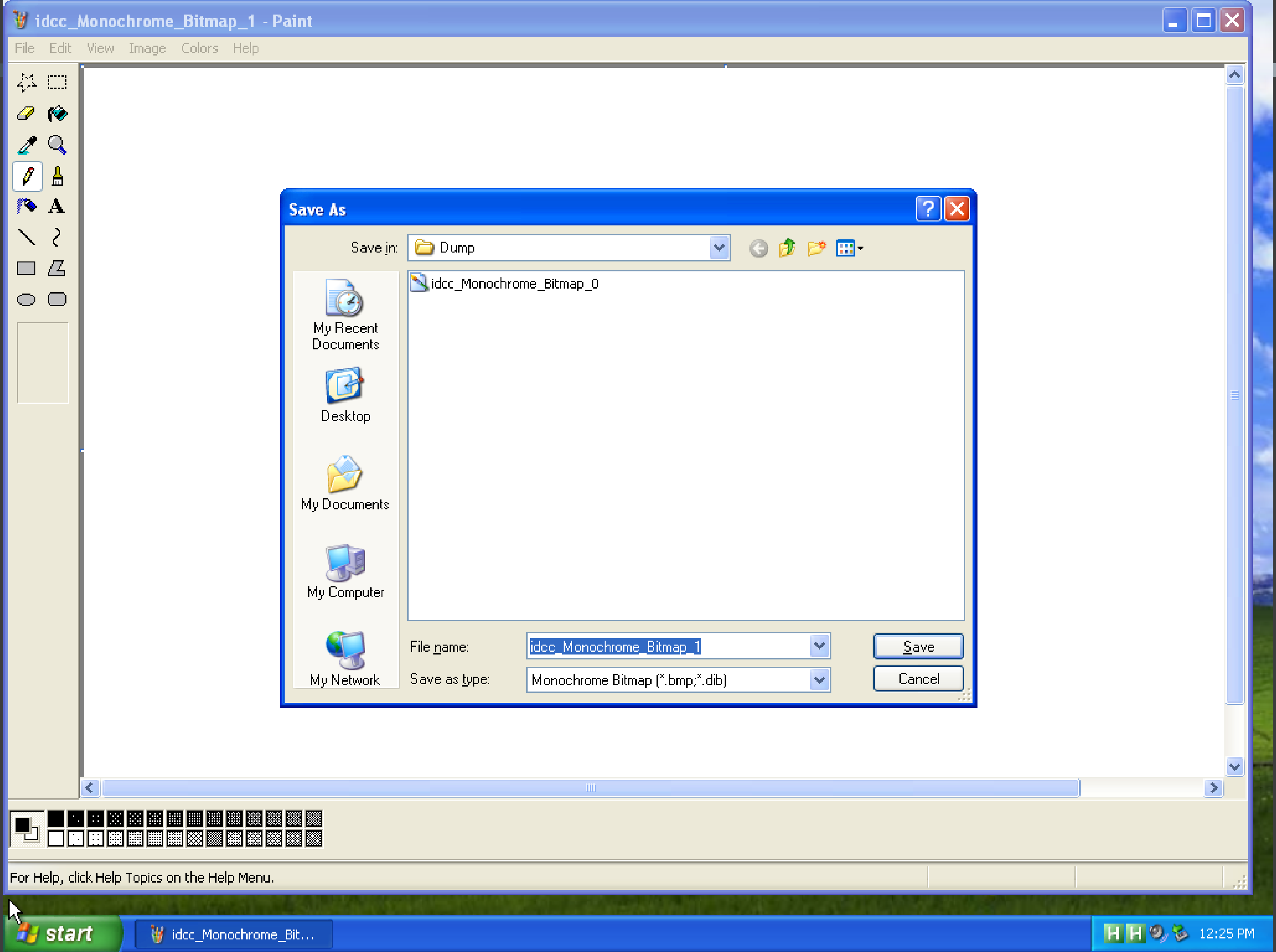
Hello IDCC 2022!

For Help, click Help Topics on the Help Menu.



File name: C:\Dump\idcc_Monochrome_Bitmap_0.bmp

Save as type: Monochrome Bitmap (*.bmp;*.dib)

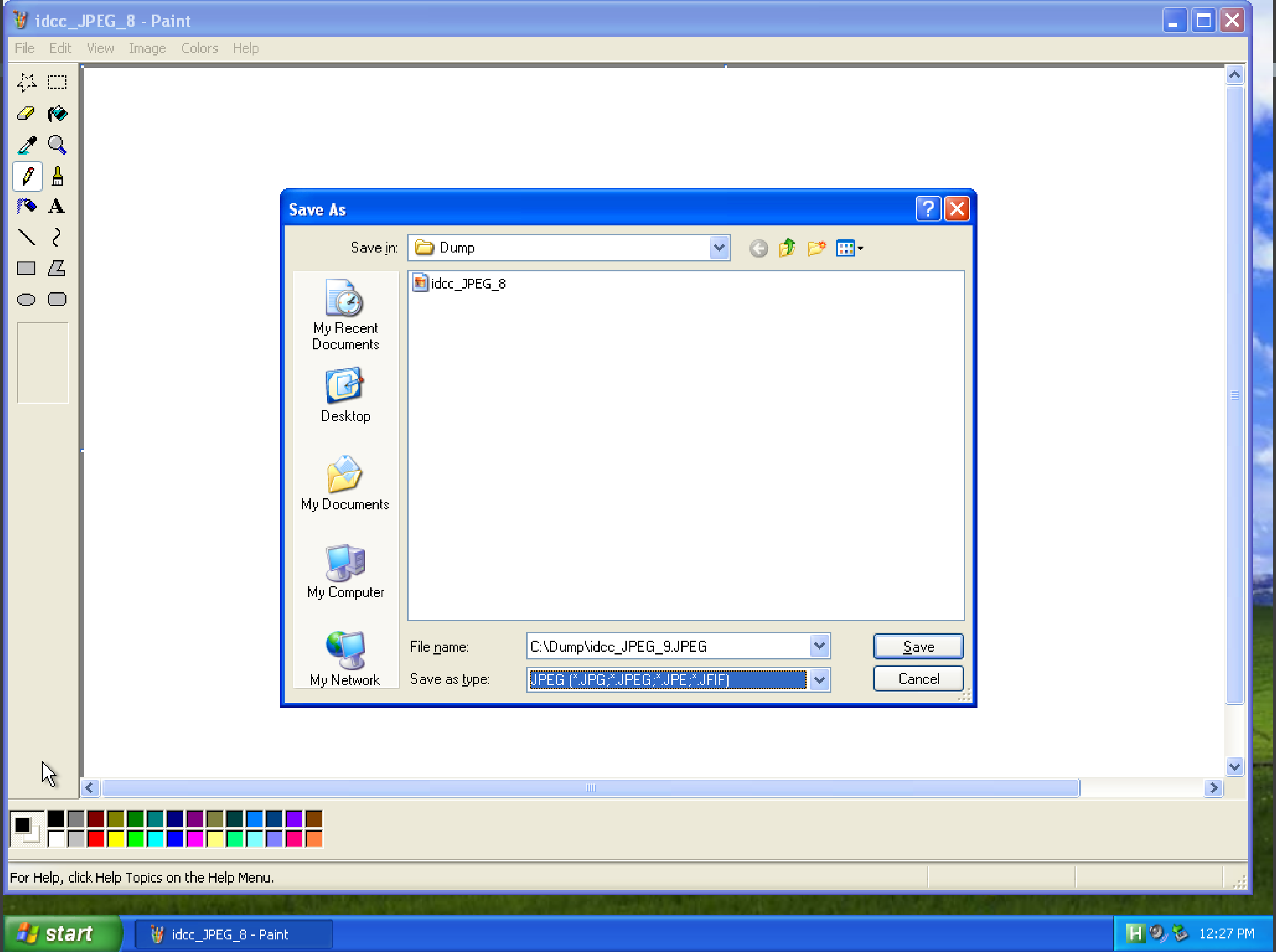


Save in: Dump

idcc_Monochrome_Bitmap_0

File name: idcc_Monochrome_Bitmap_1

Save as type: Monochrome Bitmap (*.bmp;*.dib)

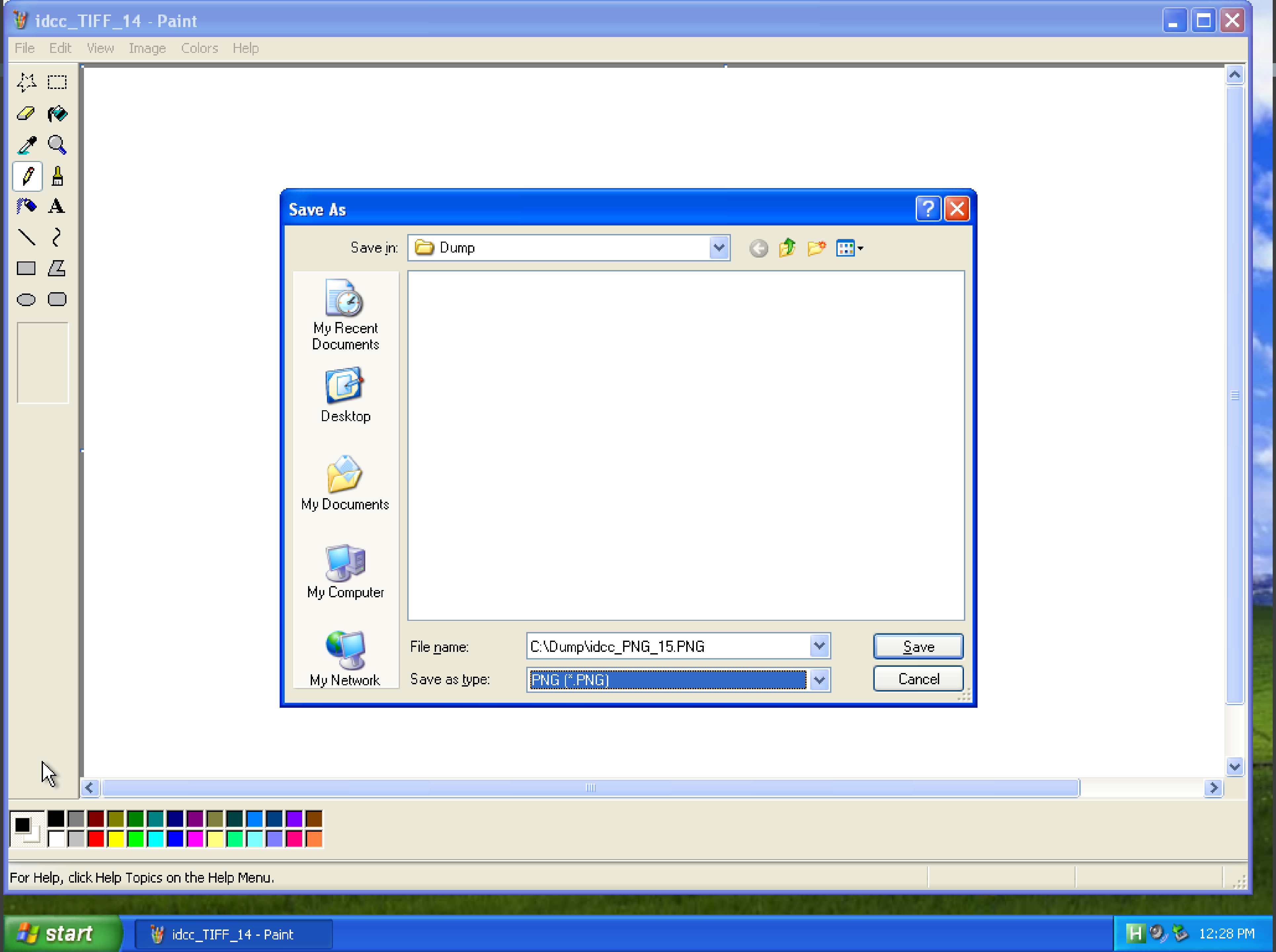


Save in: Dump

File name: C:\Dump\idcc_JPEG_9.JPEG

Save as type: JPEG (*.JPG;*.JPEG;*.JPE;*.JFIF)

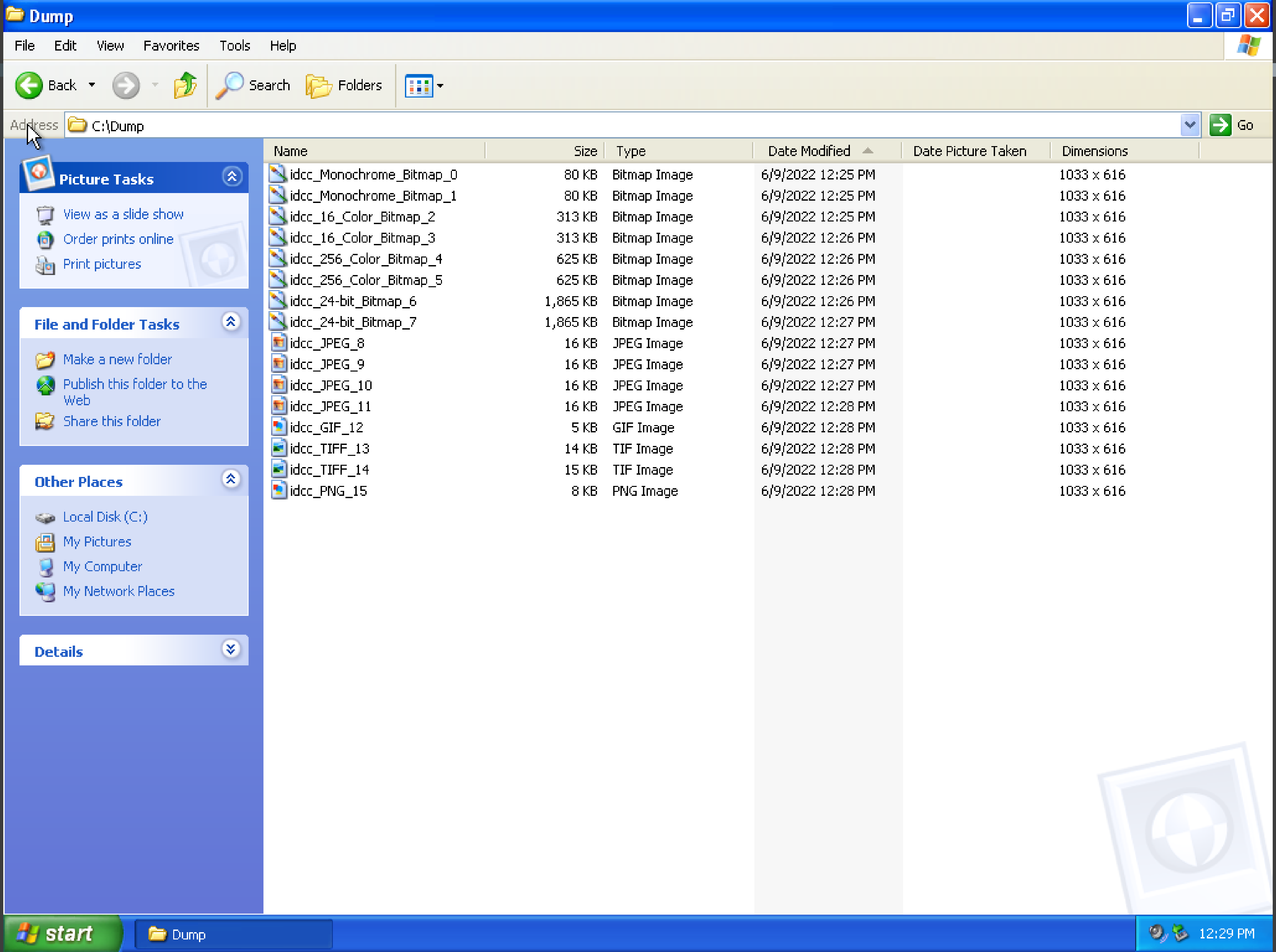
For Help, click Help Topics on the Help Menu.



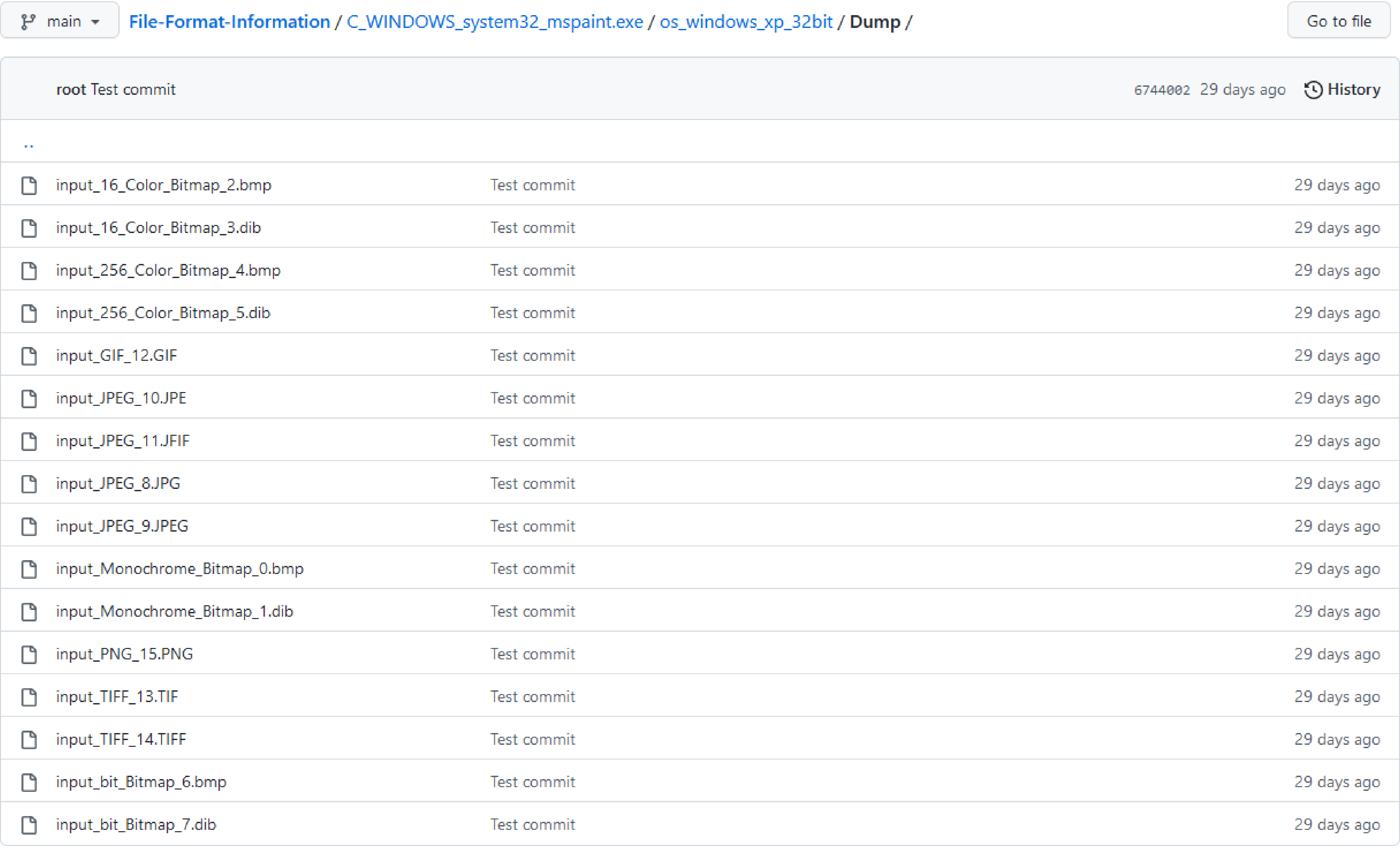
Save in: Dump

File name: C:\Dump\idcc_PNG_15.PNG

Save as type: PNG (*.PNG)



Name	Size	Type	Date Modified	Date Picture Taken	Dimensions
idcc_Monochrome_Bitmap_0	80 KB	Bitmap Image	6/9/2022 12:25 PM		1033 x 616
idcc_Monochrome_Bitmap_1	80 KB	Bitmap Image	6/9/2022 12:25 PM		1033 x 616
idcc_16_Color_Bitmap_2	313 KB	Bitmap Image	6/9/2022 12:25 PM		1033 x 616
idcc_16_Color_Bitmap_3	313 KB	Bitmap Image	6/9/2022 12:26 PM		1033 x 616
idcc_256_Color_Bitmap_4	625 KB	Bitmap Image	6/9/2022 12:26 PM		1033 x 616
idcc_256_Color_Bitmap_5	625 KB	Bitmap Image	6/9/2022 12:26 PM		1033 x 616
idcc_24-bit_Bitmap_6	1,865 KB	Bitmap Image	6/9/2022 12:26 PM		1033 x 616
idcc_24-bit_Bitmap_7	1,865 KB	Bitmap Image	6/9/2022 12:27 PM		1033 x 616
idcc_JPEG_8	16 KB	JPEG Image	6/9/2022 12:27 PM		1033 x 616
idcc_JPEG_9	16 KB	JPEG Image	6/9/2022 12:27 PM		1033 x 616
idcc_JPEG_10	16 KB	JPEG Image	6/9/2022 12:27 PM		1033 x 616
idcc_JPEG_11	16 KB	JPEG Image	6/9/2022 12:28 PM		1033 x 616
idcc_GIF_12	5 KB	GIF Image	6/9/2022 12:28 PM		1033 x 616
idcc_TIFF_13	14 KB	TIF Image	6/9/2022 12:28 PM		1033 x 616
idcc_TIFF_14	15 KB	TIF Image	6/9/2022 12:28 PM		1033 x 616
idcc_PNG_15	8 KB	PNG Image	6/9/2022 12:28 PM		1033 x 616



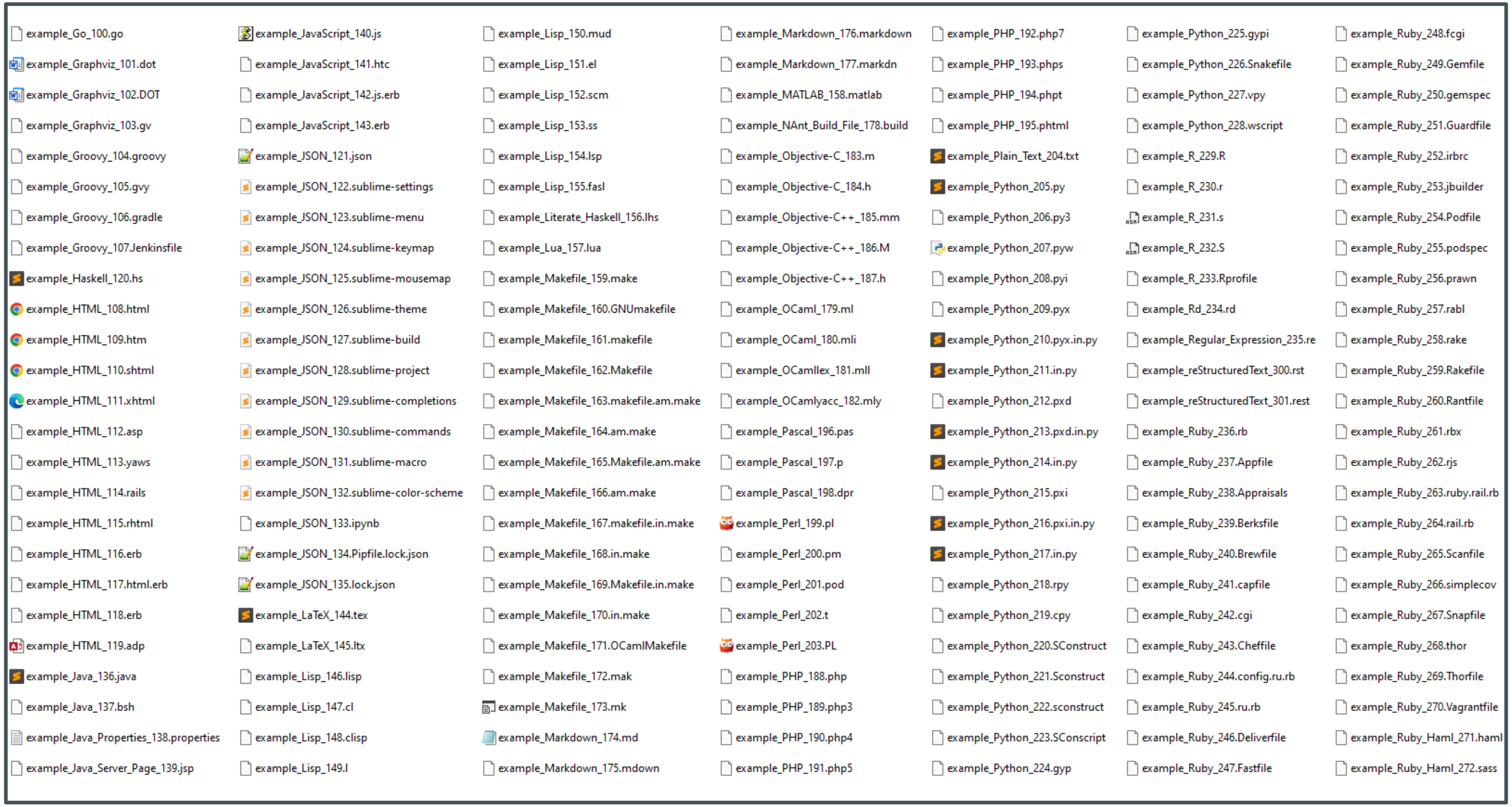
File-Format-Information / C_WINDOWS_system32_mspaint.exe / os_windows_xp_32bit / Dump /

root Test commit 6744002 29 days ago

..

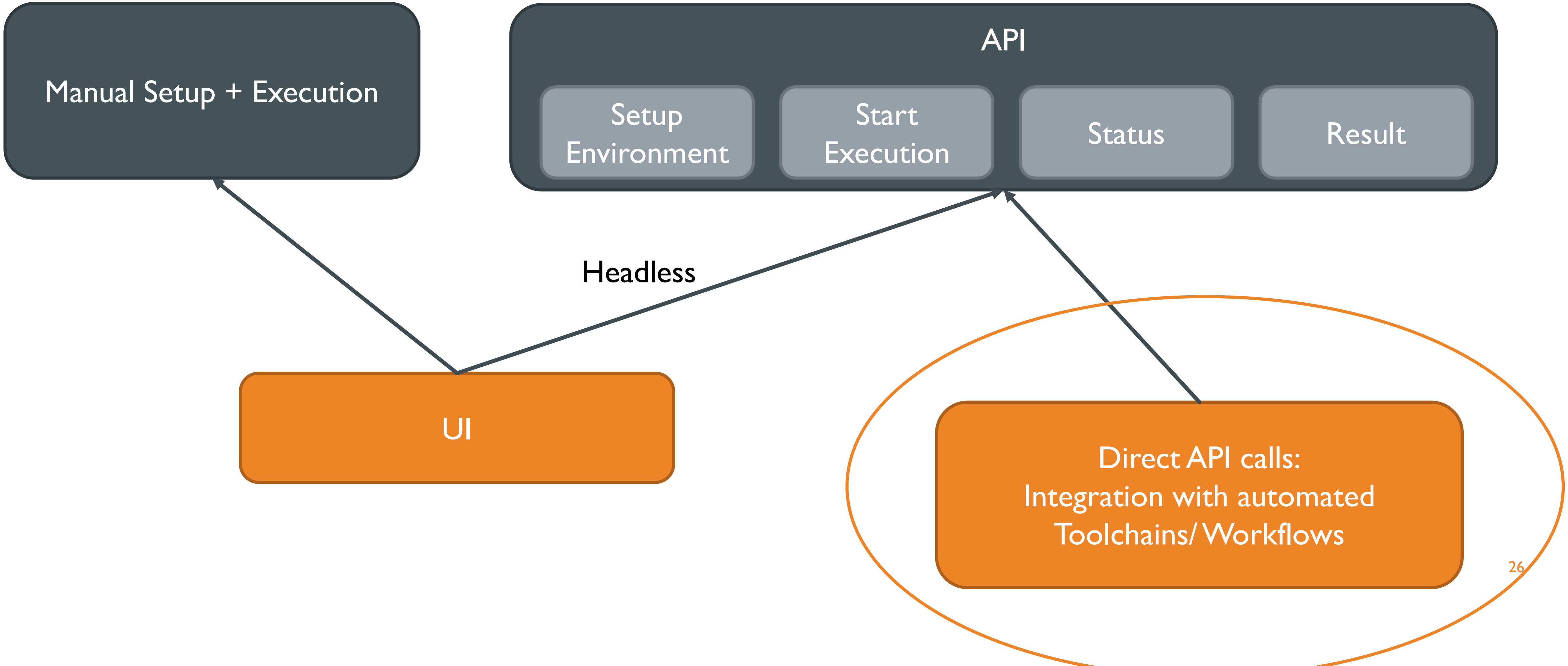
input_16_Color_Bitmap_2.bmp	Test commit	29 days ago
input_16_Color_Bitmap_3.dib	Test commit	29 days ago
input_256_Color_Bitmap_4.bmp	Test commit	29 days ago
input_256_Color_Bitmap_5.dib	Test commit	29 days ago
input_GIF_12.GIF	Test commit	29 days ago
input_JPEG_10.JPE	Test commit	29 days ago
input_JPEG_11.JFIF	Test commit	29 days ago
input_JPEG_8.JPG	Test commit	29 days ago
input_JPEG_9.JPEG	Test commit	29 days ago
input_Monochrome_Bitmap_0.bmp	Test commit	29 days ago
input_Monochrome_Bitmap_1.dib	Test commit	29 days ago
input_PNG_15.PNG	Test commit	29 days ago
input_TIFF_13.TIF	Test commit	29 days ago
input_TIFF_14.TIFF	Test commit	29 days ago
input_bit_Bitmap_6.bmp	Test commit	29 days ago
input_bit_Bitmap_7.dib	Test commit	29 days ago

TEXT EDITORS CAN CREATE ~300 FILES!

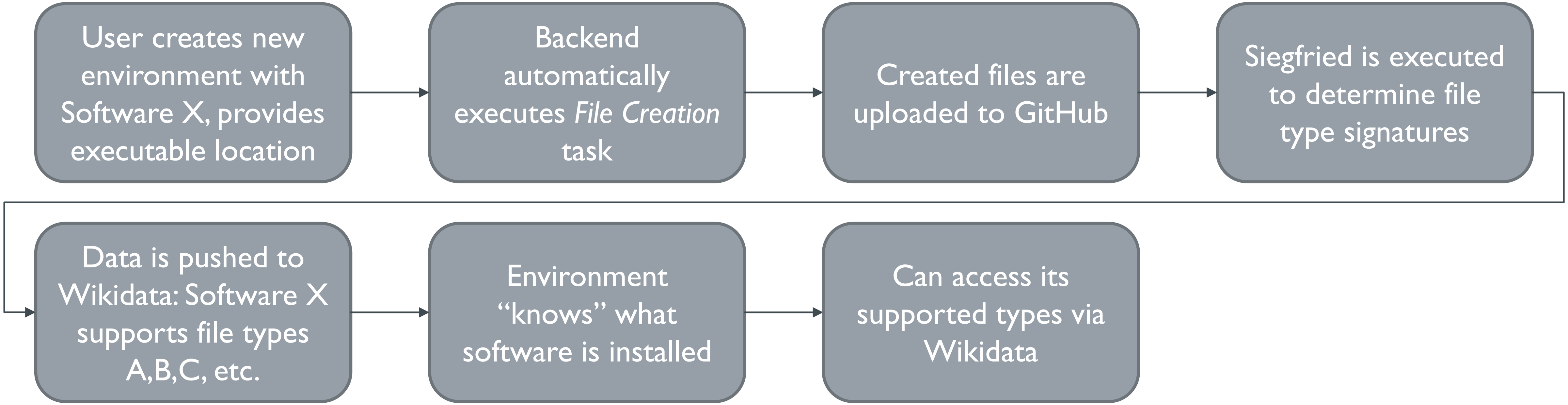


```
example_Go_100.go
example_Graphviz_101.dot
example_Graphviz_102.DOT
example_Graphviz_103.gv
example_Groovy_104.groovy
example_Groovy_105.gvy
example_Groovy_106.gradle
example_Groovy_107.Jenkinsfile
example_Haskell_120.hs
example_HTML_108.html
example_HTML_109.htm
example_HTML_110.shtml
example_HTML_111.xhtml
example_HTML_112.asp
example_HTML_113.yaws
example_HTML_114.rails
example_HTML_115.rhtml
example_HTML_116.erb
example_HTML_117.html.erb
example_HTML_118.erb
example_HTML_119.adp
example_Java_136.java
example_Java_137.bsh
example_Java_Properties_138.properties
example_Java_Server_Page_139.jsp
example_JavaScript_140.js
example_JavaScript_141.htc
example_JavaScript_142.js.erb
example_JavaScript_143.erb
example_JSON_121.json
example_JSON_122.sublime-settings
example_JSON_123.sublime-menu
example_JSON_124.sublime-keymap
example_JSON_125.sublime-mousemap
example_JSON_126.sublime-theme
example_JSON_127.sublime-build
example_JSON_128.sublime-project
example_JSON_129.sublime-completions
example_JSON_130.sublime-commands
example_JSON_131.sublime-macro
example_JSON_132.sublime-color-scheme
example_JSON_133.ipynb
example_JSON_134.Pipfile.lock.json
example_JSON_135.lock.json
example_LaTeX_144.tex
example_LaTeX_145.ltx
example_Lisp_146.lisp
example_Lisp_147.cl
example_Lisp_148.clisp
example_Lisp_149.l
example_Lisp_150.mud
example_Lisp_151.el
example_Lisp_152.scm
example_Lisp_153.ss
example_Lisp_154.lsp
example_Lisp_155.fasl
example_Literate_Haskell_156.lhs
example_Lua_157.lua
example_Makefile_159.make
example_Makefile_160.GNUmakefile
example_Makefile_161.makefile
example_Makefile_162.Makefile
example_Makefile_163.makefile.am.make
example_Makefile_164.am.make
example_Makefile_165.Makefile.am.make
example_Makefile_166.am.make
example_Makefile_167.makefile.in.make
example_Makefile_168.in.make
example_Makefile_169.Makefile.in.make
example_Makefile_170.in.make
example_Makefile_171.OCamlMakefile
example_Makefile_172.mak
example_Makefile_173.mk
example_Markdown_174.md
example_Markdown_175.mdown
example_Markdown_176.markdown
example_Markdown_177.markdn
example_MATLAB_158.matlab
example_NAnt_Build_File_178.build
example_Objective-C_183.m
example_Objective-C_184.h
example_Objective-C++_185.mm
example_Objective-C++_186.M
example_Objective-C++_187.h
example_OCaml_179.ml
example_OCaml_180.mli
example_OCamllex_181.mll
example_OCamlyacc_182.mly
example_Pascal_196.pas
example_Pascal_197.p
example_Pascal_198.dpr
example_Perl_199.pl
example_Perl_200.pm
example_Perl_201.pod
example_Perl_202.t
example_Perl_203.PL
example_PHP_188.php
example_PHP_189.php3
example_PHP_190.php4
example_PHP_191.php5
example_PHP_192.php7
example_PHP_193.phps
example_PHP_194.phpt
example_PHP_195.phtml
example_Plain_Text_204.txt
example_Python_205.py
example_Python_206.py3
example_Python_207.pyw
example_Python_208.pyi
example_Python_209.pyx
example_Python_210.pyx.in.py
example_Python_211.in.py
example_Python_212.pxd
example_Python_213.pxd.in.py
example_Python_214.in.py
example_Python_215.pxi
example_Python_216.pxi.in.py
example_Python_217.in.py
example_Python_218.rpy
example_Python_219.cpy
example_Python_220.SConstruct
example_Python_221.Sconstruct
example_Python_222.sconstruct
example_Python_223.SConscript
example_Python_224.gyp
example_Python_225.gypi
example_Python_226.Snakefile
example_Python_227.vpy
example_Python_228.wscript
example_R_229.R
example_R_230.r
example_R_231.s
example_R_232.S
example_R_233.Rprofile
example_Rd_234.rd
example_Regular_Expression_235.re
example_reStructuredText_300.rst
example_reStructuredText_301.rest
example_Ruby_236.rb
example_Ruby_237.Appfile
example_Ruby_238.Appraisals
example_Ruby_239.Berksfile
example_Ruby_240.Brewfile
example_Ruby_241.capfile
example_Ruby_242.cgi
example_Ruby_243.Cheffile
example_Ruby_244.config.ru.rb
example_Ruby_245.ru.rb
example_Ruby_246.Deliverfile
example_Ruby_247.Fastfile
example_Ruby_248.fcgi
example_Ruby_249.Gemfile
example_Ruby_250.gemspec
example_Ruby_251.Guardfile
example_Ruby_252.irbrc
example_Ruby_253.jbuilder
example_Ruby_254.Podfile
example_Ruby_255.podspec
example_Ruby_256.prawn
example_Ruby_257.rabl
example_Ruby_258.rake
example_Ruby_259.Rakefile
example_Ruby_260.Rantfile
example_Ruby_261.rbx
example_Ruby_262.rjs
example_Ruby_263.ruby.rail.rb
example_Ruby_264.rail.rb
example_Ruby_265.Scanfile
example_Ruby_266.simplecov
example_Ruby_267.Snapfile
example_Ruby_268.thor
example_Ruby_269.Thorfile
example_Ruby_270.Vagrantfile
example_Ruby_Haml_271.haml
example_Ruby_Haml_272.sass
```

INTEGRATION OVERVIEW



USE-CASE: FILE CREATION



User creates new environment with Software X, provides executable location

Backend automatically executes *File Creation* task

Created files are uploaded to GitHub

Siegfried is executed to determine file type signatures

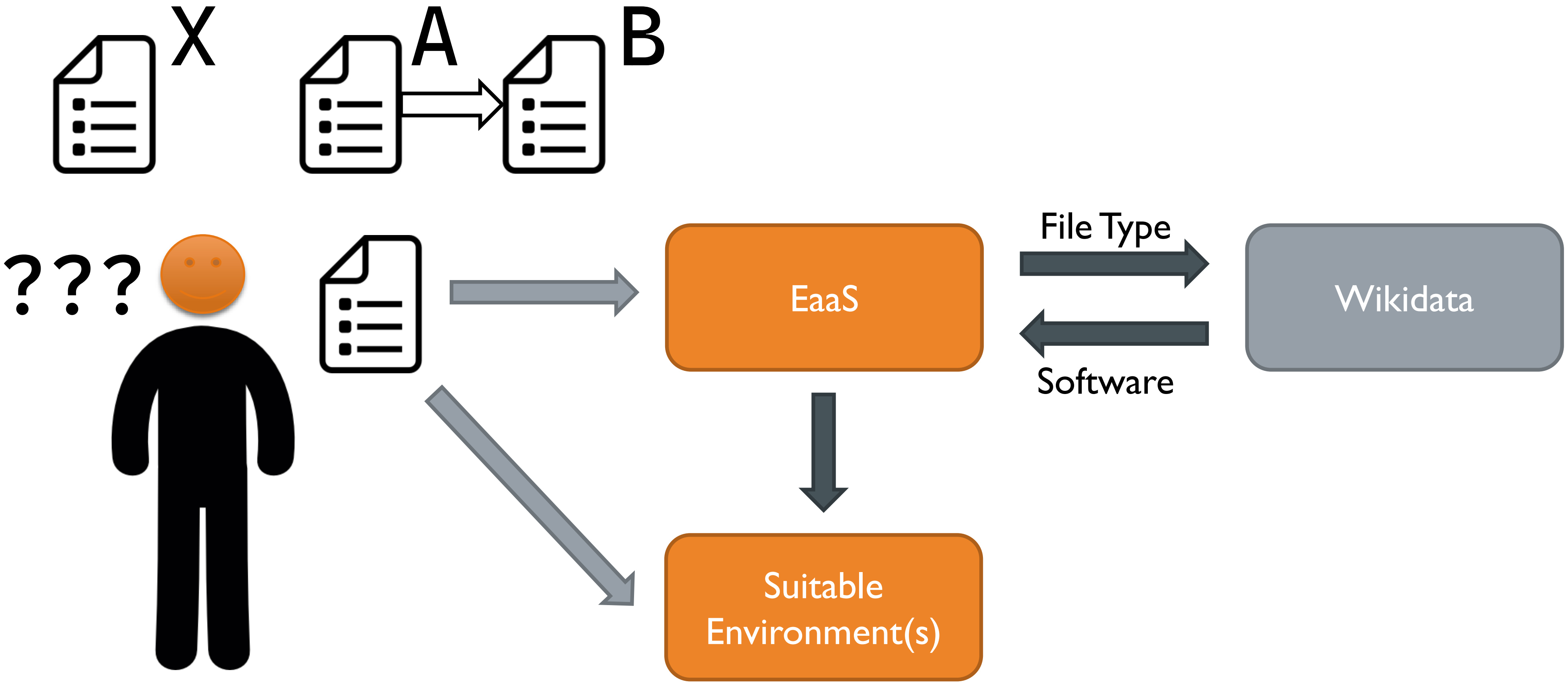
Data is pushed to Wikidata: Software X supports file types A,B,C, etc.

Environment "knows" what software is installed

Can access its supported types via Wikidata

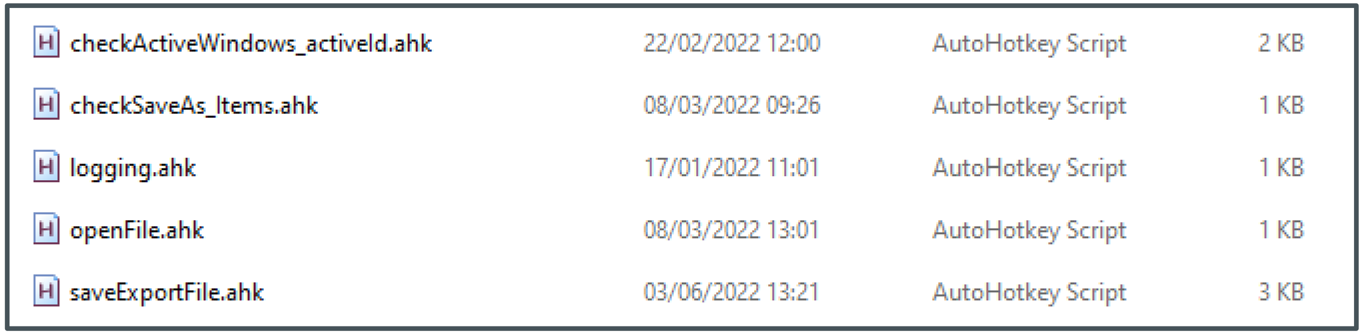
Environment knows what it is capable of
→ Improves usability

USE-CASE EXAMPLE



RESULTS

- Automate a task for multiple software
- Mix-Match/Re-use



checkActiveWindows_activeId.ahk	22/02/2022 12:00	AutoHotkey Script	2 KB
checkSaveAs_Items.ahk	08/03/2022 09:26	AutoHotkey Script	1 KB
logging.ahk	17/01/2022 11:01	AutoHotkey Script	1 KB
openFile.ahk	08/03/2022 13:01	AutoHotkey Script	1 KB
saveExportFile.ahk	03/06/2022 13:21	AutoHotkey Script	3 KB

- Requires software to support certain interfaces. Microsoft Office e.g., does not use *normal* menus!
- Is AHK the best solution? We don’t know!

APPROACH 2: AUTOMATION RECORDING

- *External* Automation
- No knowledge/Independent of the Software or OS
- Mimics human inputs → Recordable!
- Abstract view of the interaction = Documentation

APPROACH 2: REUSABILITY?

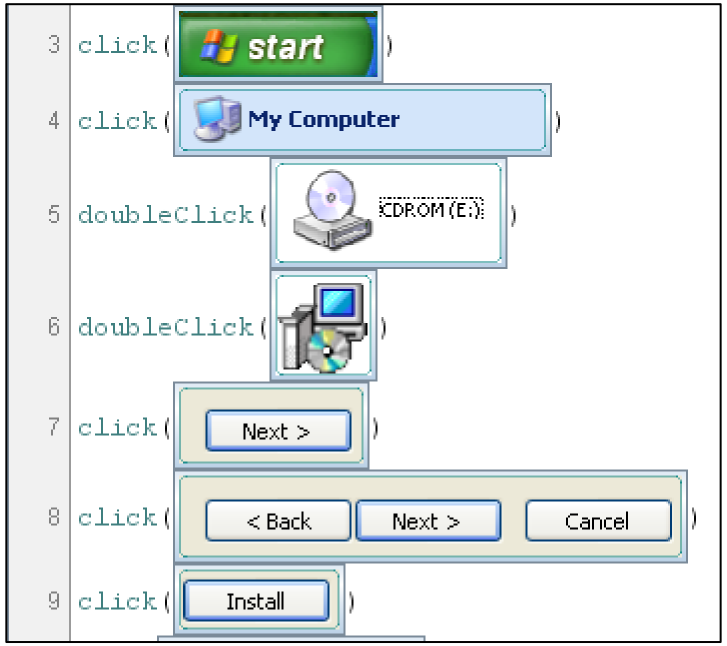
- Preconditions not 100% visually manageable – not possible to fully automate everything
- System is potentially imperfect → we can use this: Semi-automated assisted replay
- Previously recorded steps are executed until:
  1. Error appears
  2. User input is required
- System takes control afterwards

Loop until done

- Optimally: Annotations/Help for the user, explicit documentation
- Batch processing possible with human support (only interacts where necessary)
- Eventually, AI (again ☺)

APPROACH 2: AUTOMATION RECORDING

- Example Implementation: SikuliX[1]

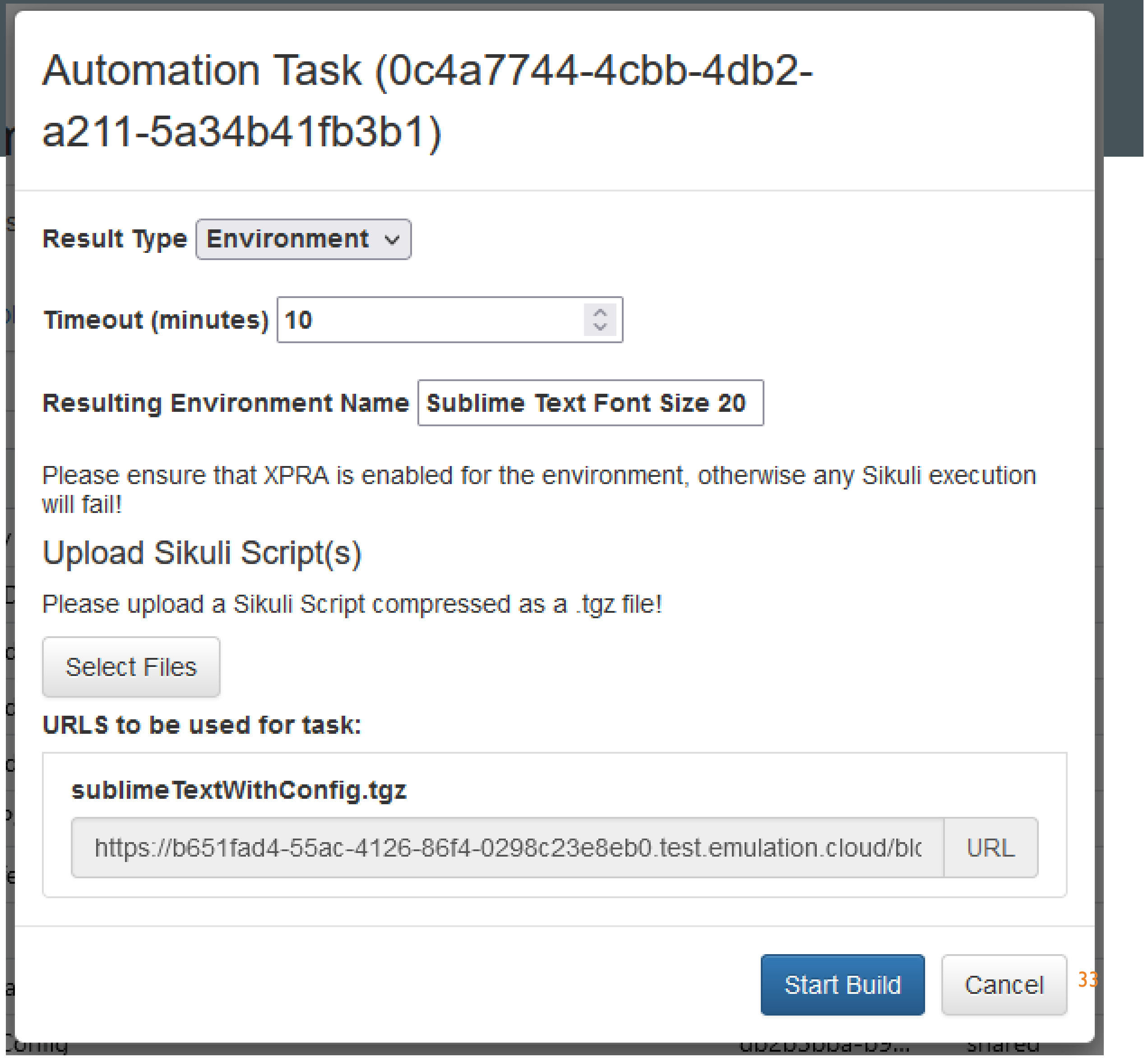


```
click( )
click( )
doubleClick( )
doubleClick( )
click( )
click( )
click( )
```

[1] http://sikulix.com/

EXAMPLE

- Empty Windows XP environment
- ISO with Sublime text installer in CD-ROM drive
- Script to install and configure font size



Automation Task (0c4a7744-4cbb-4db2-a211-5a34b41fb3b1)

Result Type Environment

Timeout (minutes) 10

Resulting Environment Name Sublime Text Font Size 20

Please ensure that XPRA is enabled for the environment, otherwise any Sikuli execution will fail!

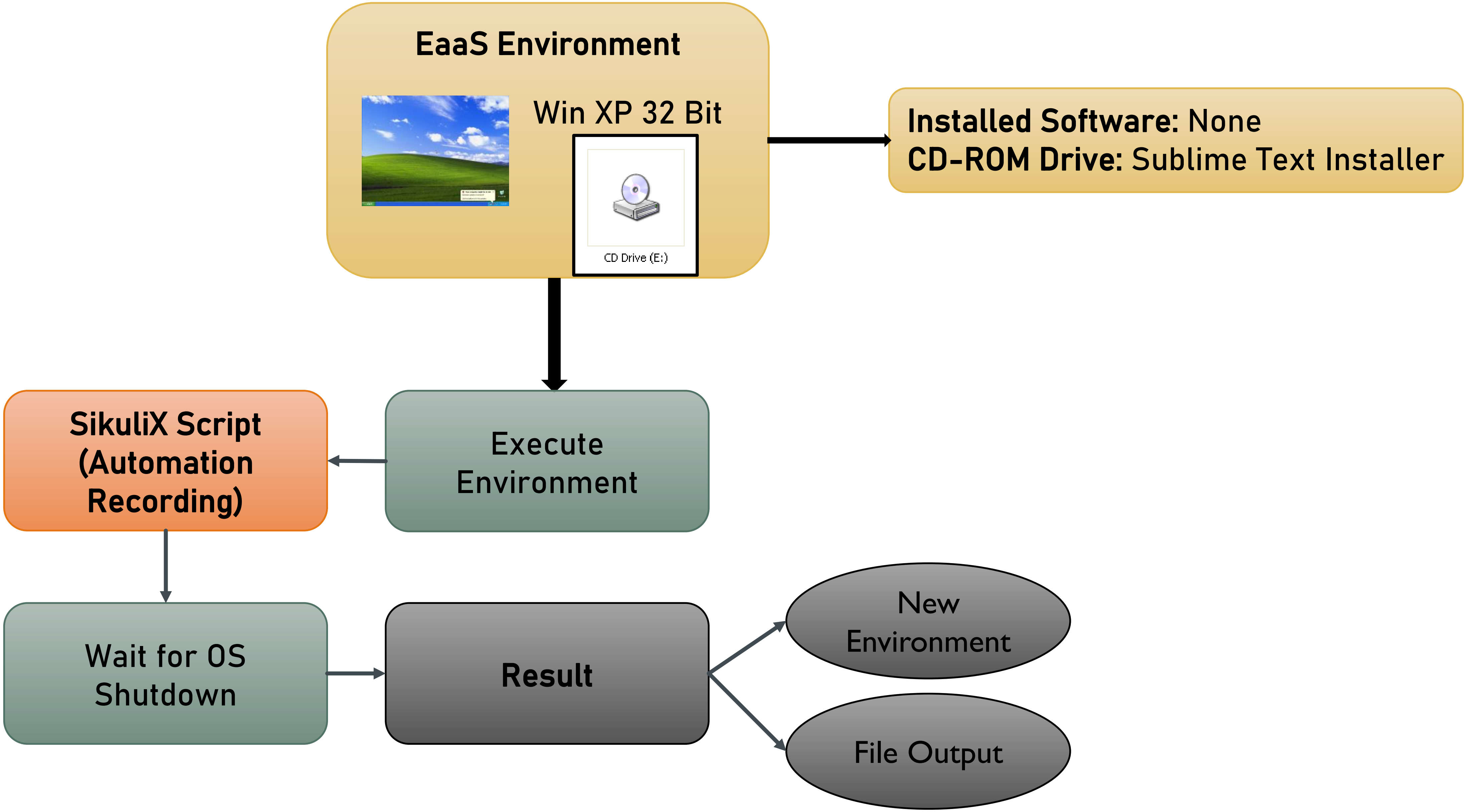
Upload Sikuli Script(s)

Please upload a Sikuli Script compressed as a .tgz file!

URLS to be used for task:

sublimeTextWithConfig.tgz

https://b651fad4-55ac-4126-86f4-0298c23e8eb0.test.emulation.cloud/blc



EaaS Environment

Win XP 32 Bit

Installed Software: None
CD-ROM Drive: Sublime Text Installer

Execute Environment

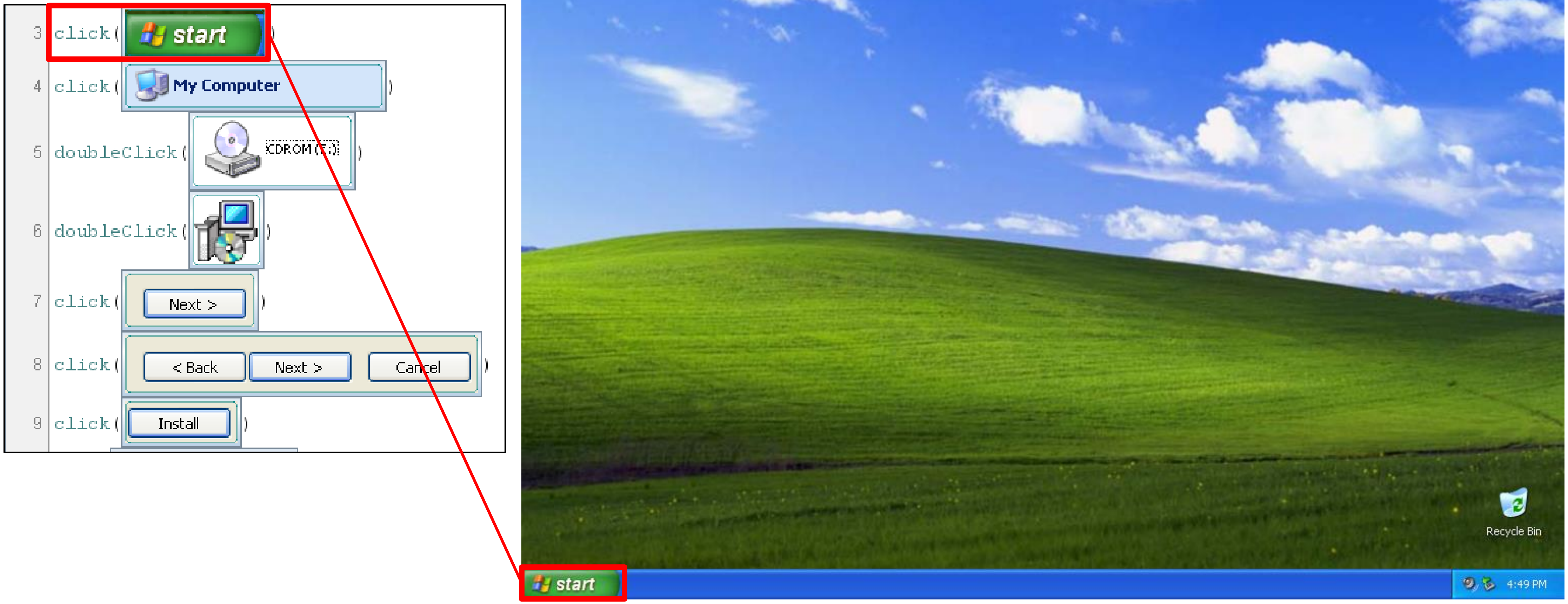
SikuliX Script (Automation Recording)

Wait for OS Shutdown

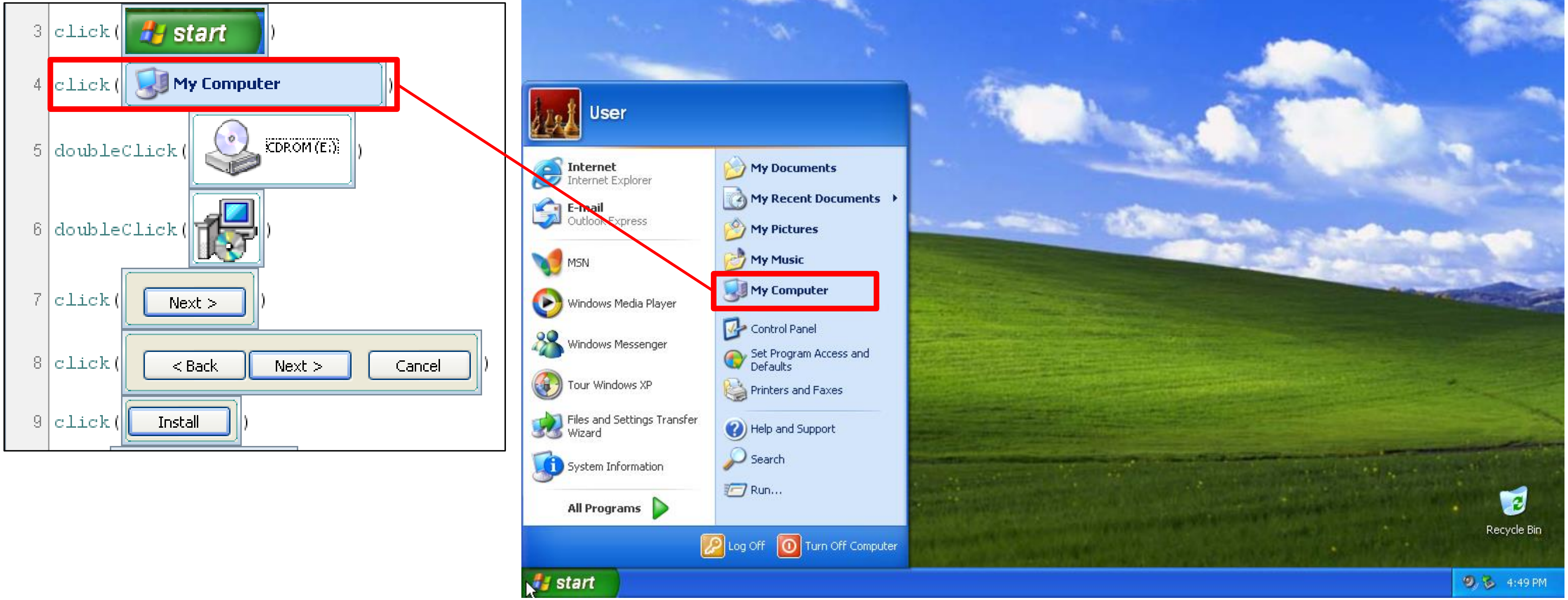
Result

New Environment

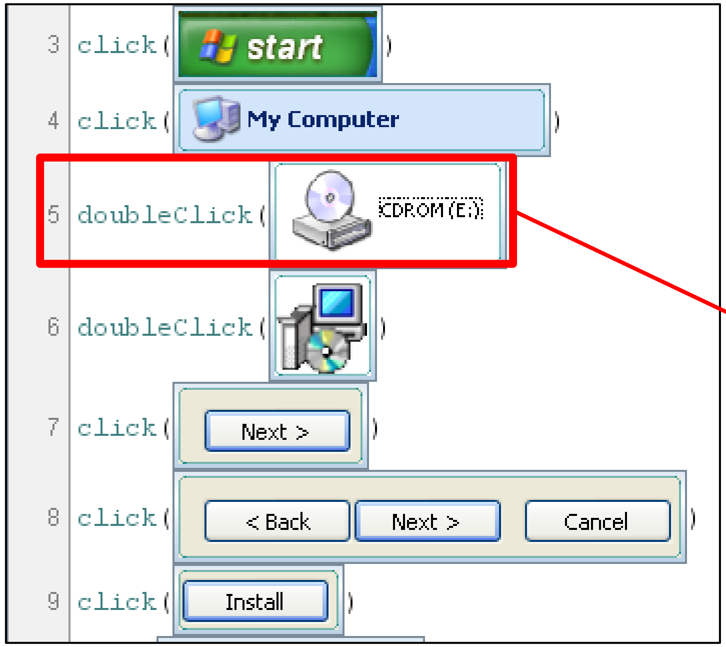
File Output



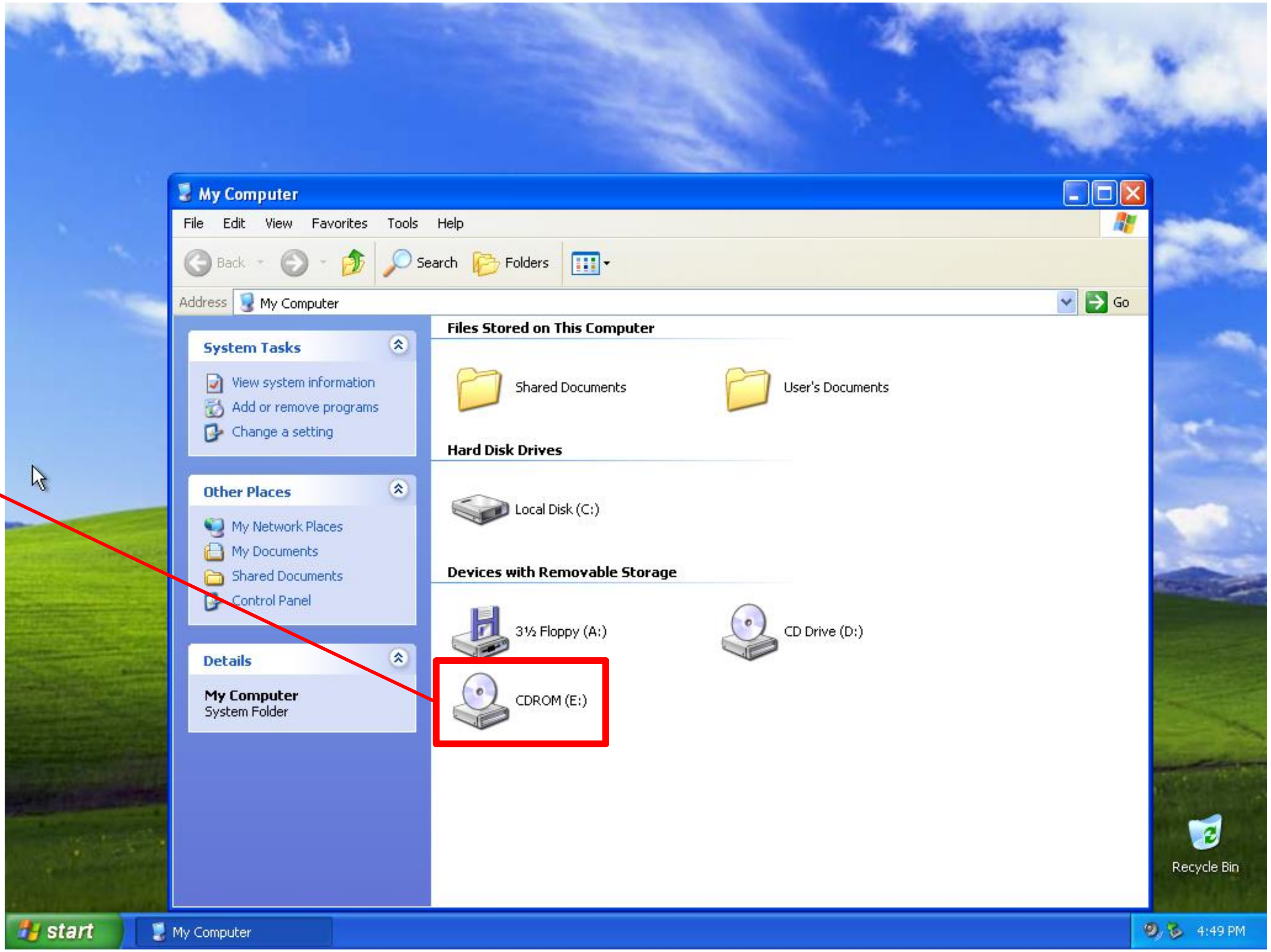
```
click( start )
click( My Computer )
doubleClick( CDROM (E:) )
doubleClick( )
click( Next > )
click( < Back  Next >  Cancel )
click( Install )
```

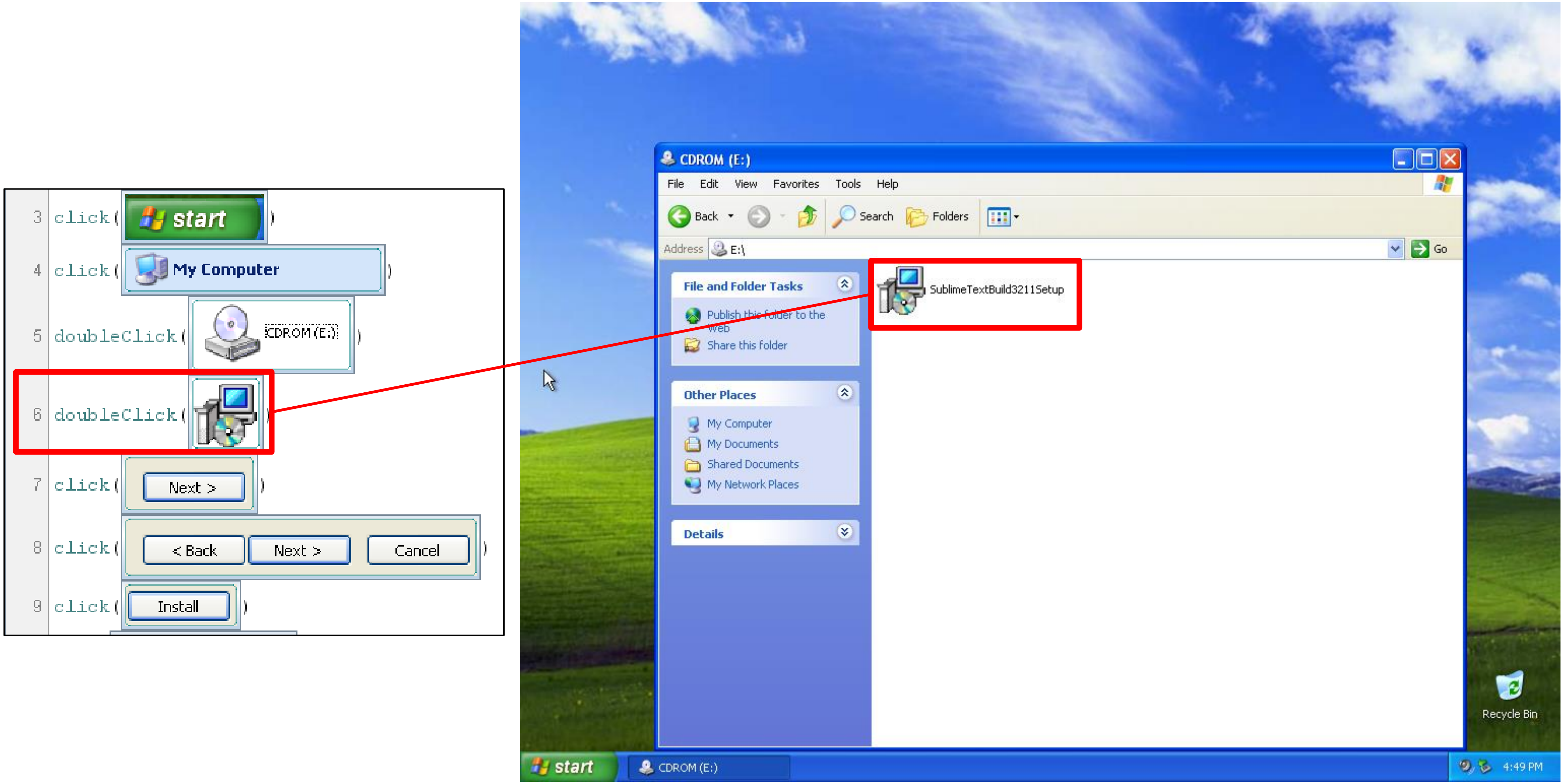


```
click( start )
click( My Computer )
doubleClick( CDROM(E:) )
doubleClick( )
click( Next > )
click( < Back  Next >  Cancel )
click( Install )
```

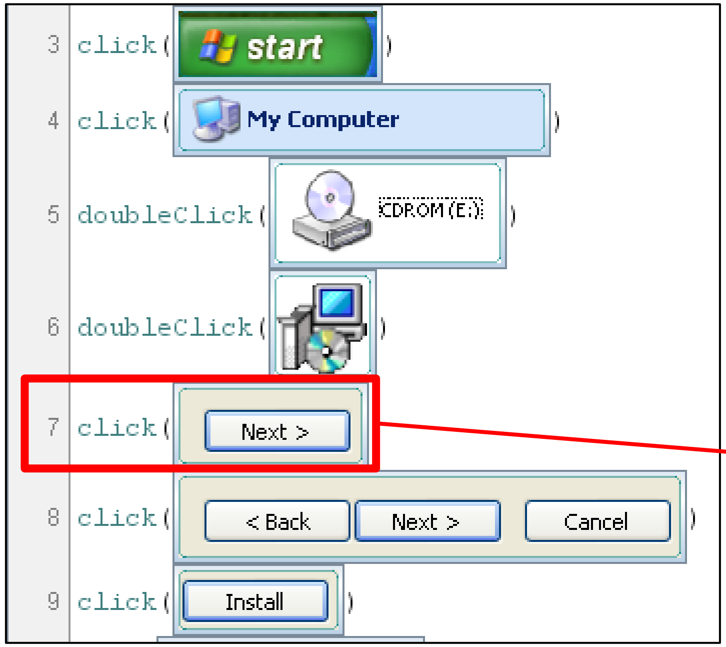


```
click(start)
click(My Computer)
doubleClick(CDROM (E:))
doubleClick()
click(Next >)
click(< Back  Next >  Cancel)
click(Install)
```

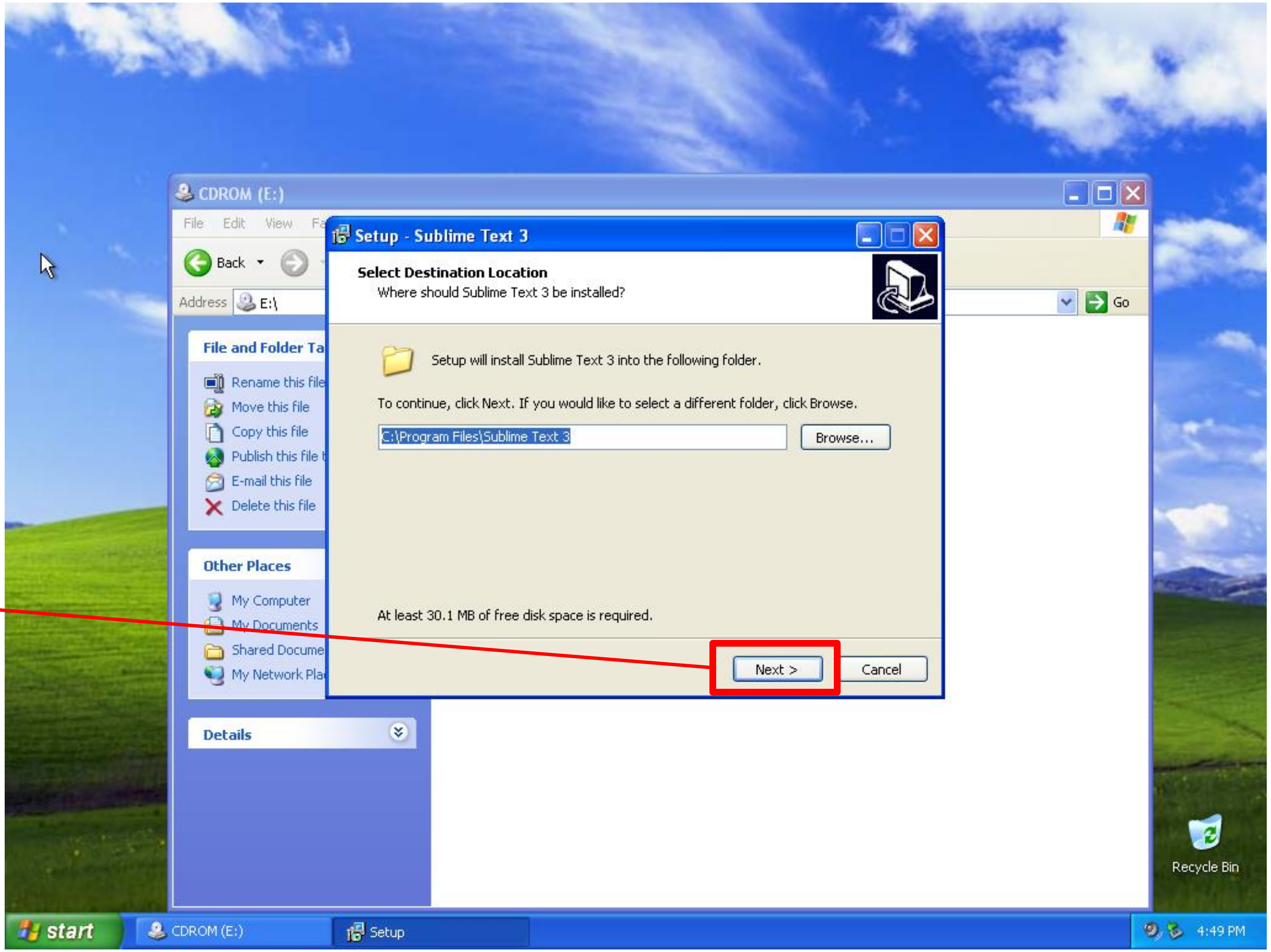




```
click( start )
click( My Computer )
doubleClick( CDROM (E:) )
doubleClick( )
click( Next > )
click( < Back  Next >  Cancel )
click( Install )
```



```
click(start)
click(My Computer)
doubleClick(CDROM (E:))
doubleClick()
click(Next >)
click(< Back Next > Cancel)
click(Install)
```



Setup - Sublime Text 3

Select Destination Location

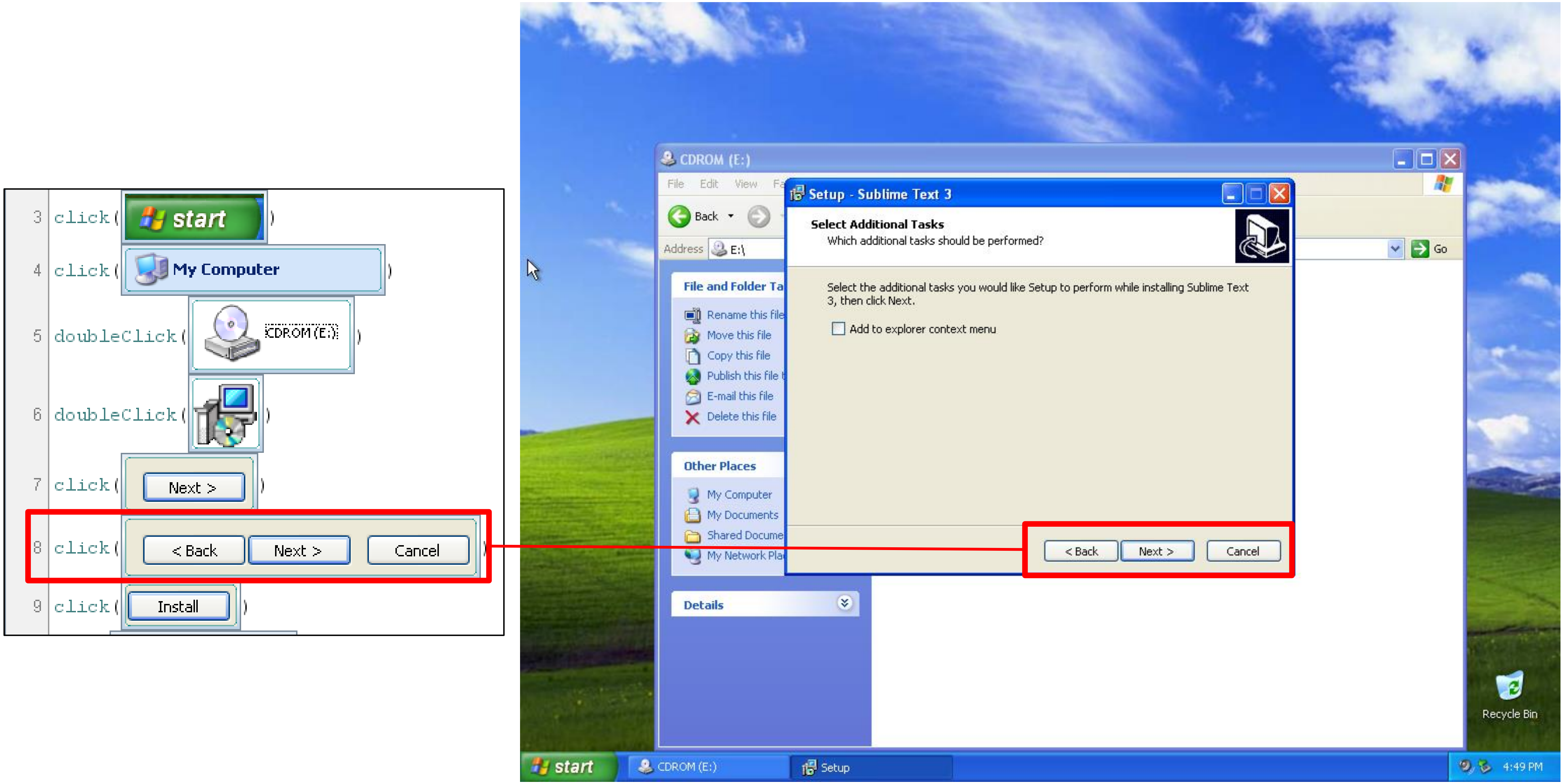
Where should Sublime Text 3 be installed?

Setup will install Sublime Text 3 into the following folder.

To continue, click Next. If you would like to select a different folder, click Browse.

C:\Program Files\Sublime Text 3

At least 30.1 MB of free disk space is required.



```
click( start )
click( My Computer )
doubleClick( CDROM (E:) )
doubleClick( )
click( Next > )
click( < Back  Next >  Cancel )
click( Install )
```

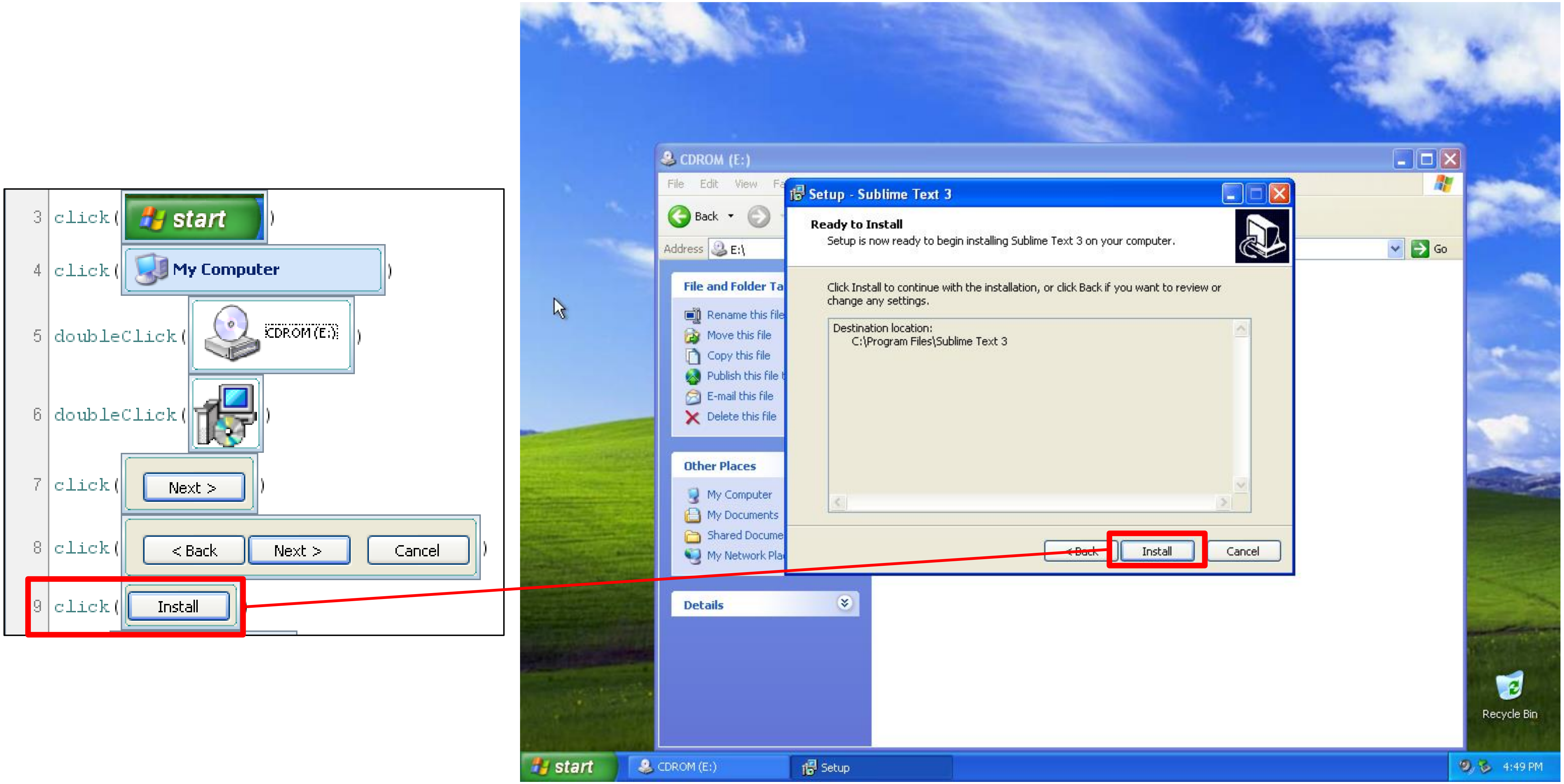
Setup - Sublime Text 3

Select Additional Tasks

Which additional tasks should be performed?

Select the additional tasks you would like Setup to perform while installing Sublime Text 3, then click Next.

□ Add to explorer context menu



```
click(start)
click(My Computer)
doubleClick(CDROM (E:))
doubleClick()
click(Next >)
click(< Back  Next >  Cancel)
click(Install)
```

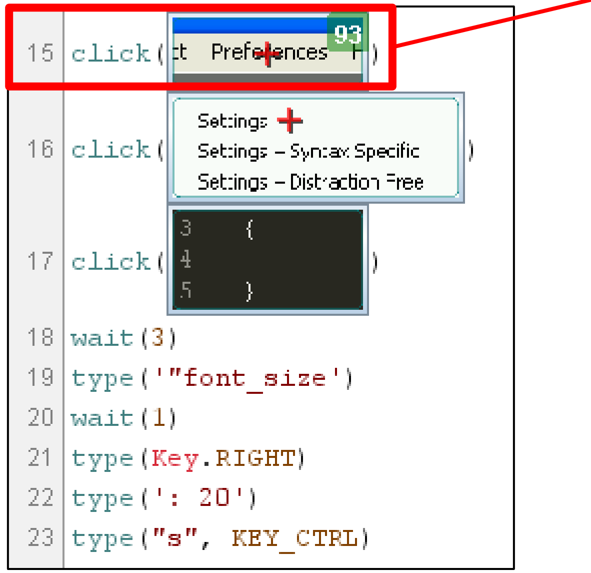
Setup - Sublime Text 3

Ready to Install

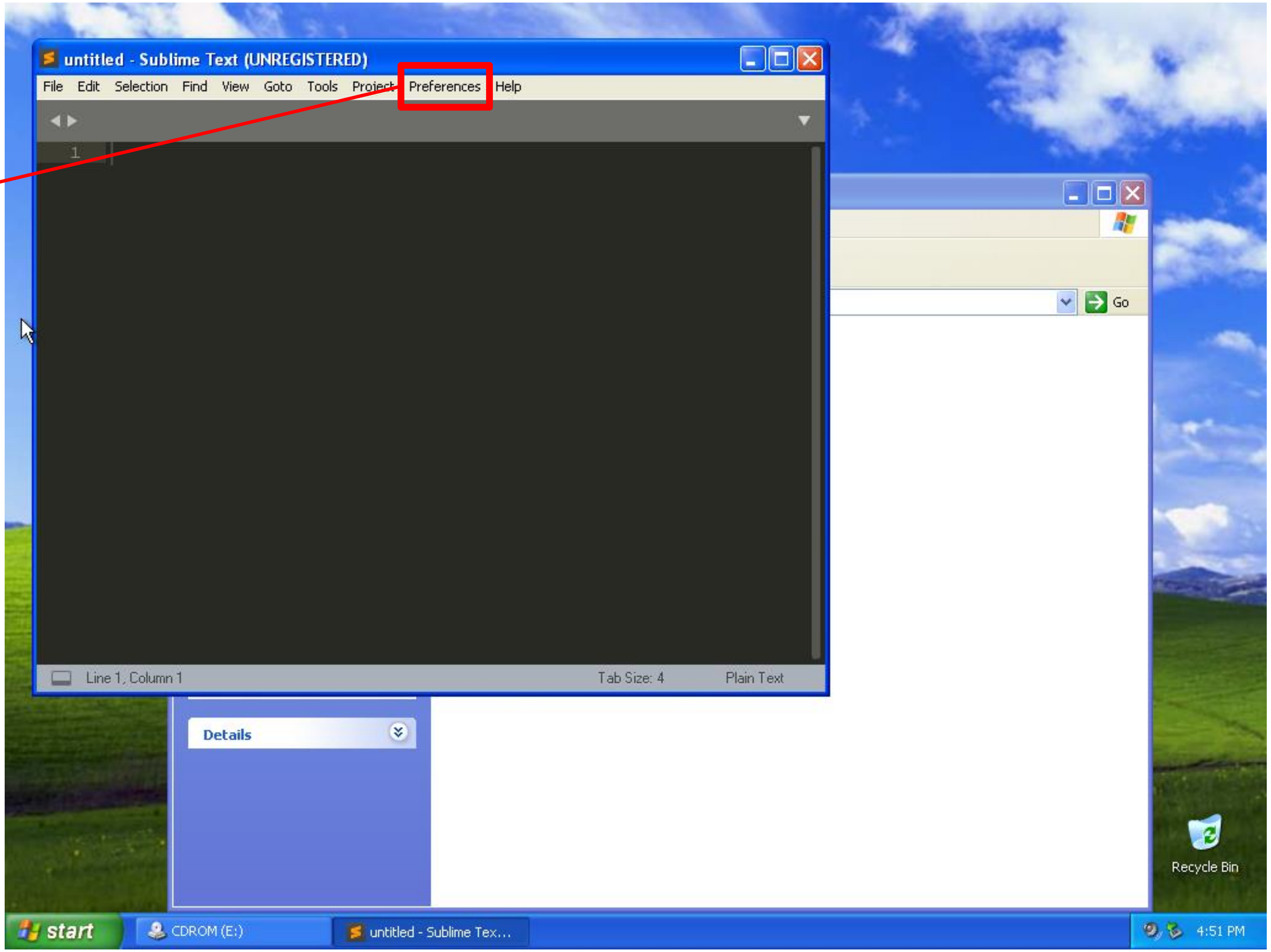
Setup is now ready to begin installing Sublime Text 3 on your computer.

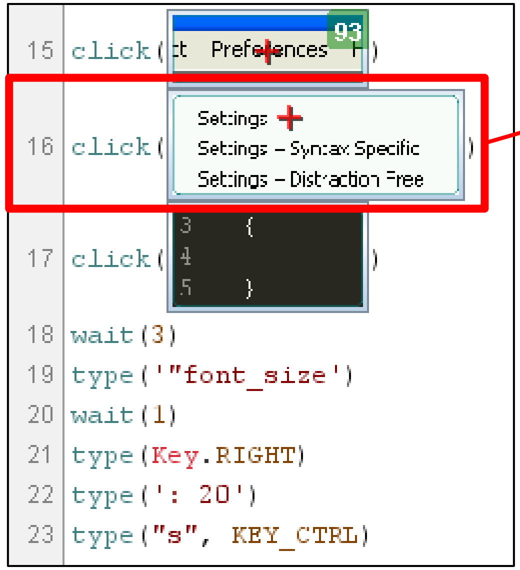
Click Install to continue with the installation, or click Back if you want to review or change any settings.

```
Destination location:
    C:\Program Files\Sublime Text 3
```

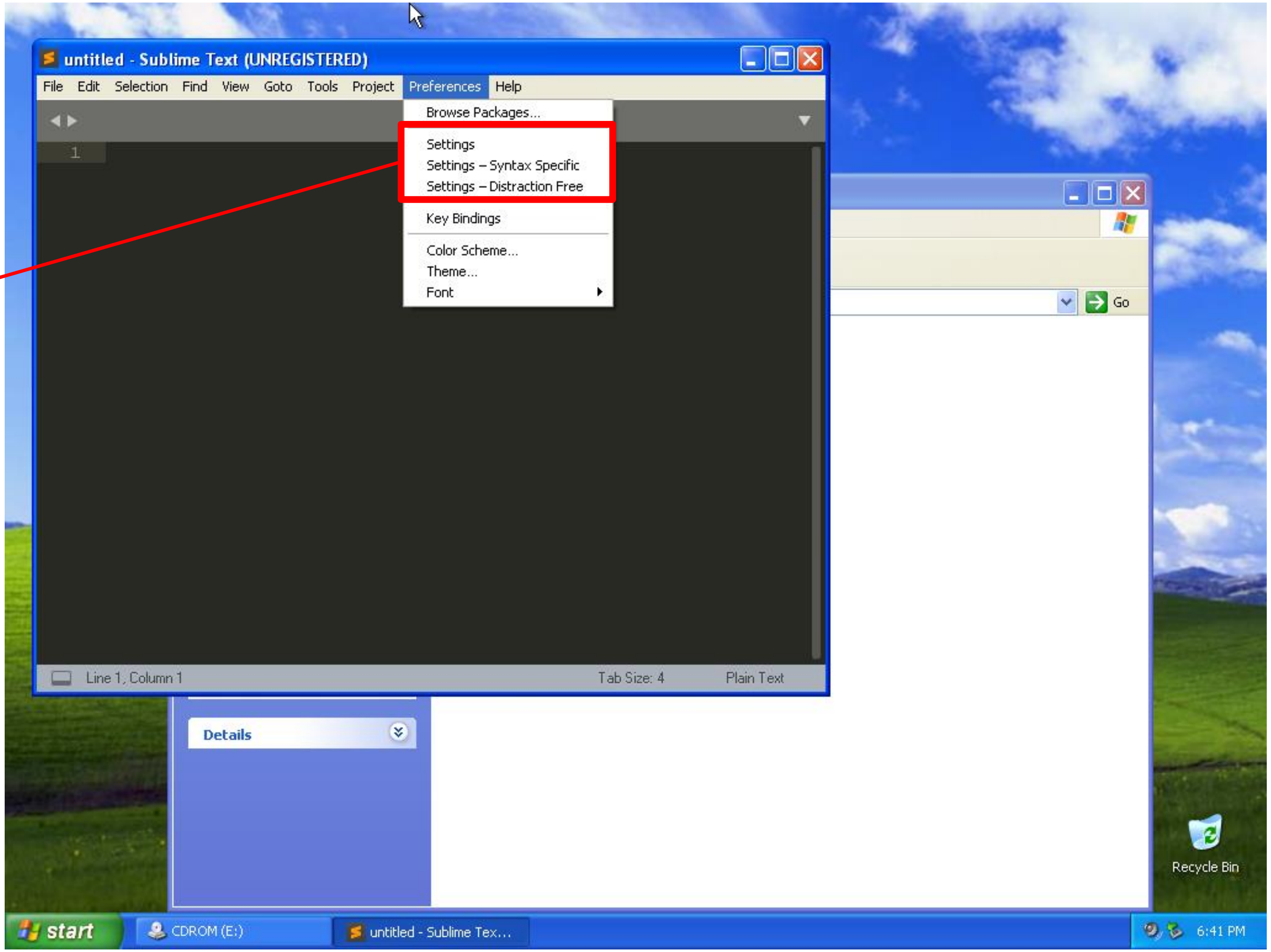


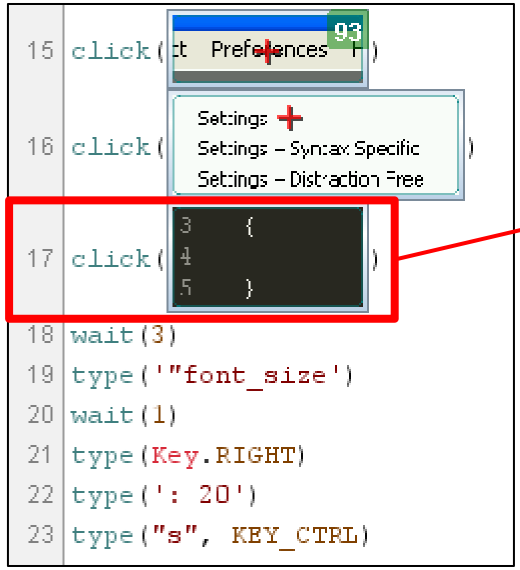
```
click( )
click( )
click( )
wait(3)
type('"font_size')
wait(1)
type(Key.RIGHT)
type(': 20')
type("s", KEY_CTRL)
```



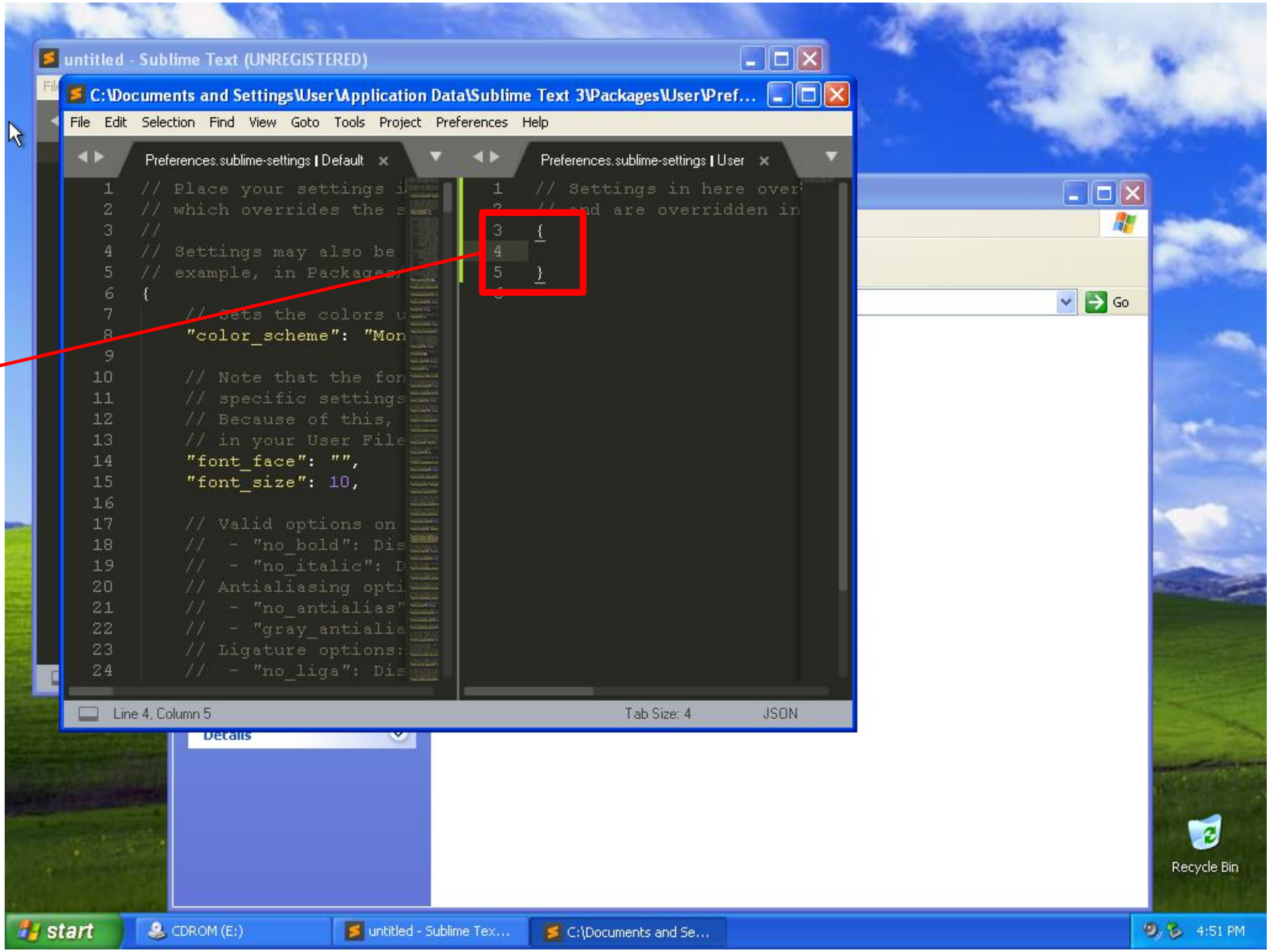


```
click(  )
click(  )
click(  )
wait(3)
type('"font_size')
wait(1)
type(Key.RIGHT)
type(': 20')
type("s", KEY_CTRL)
```





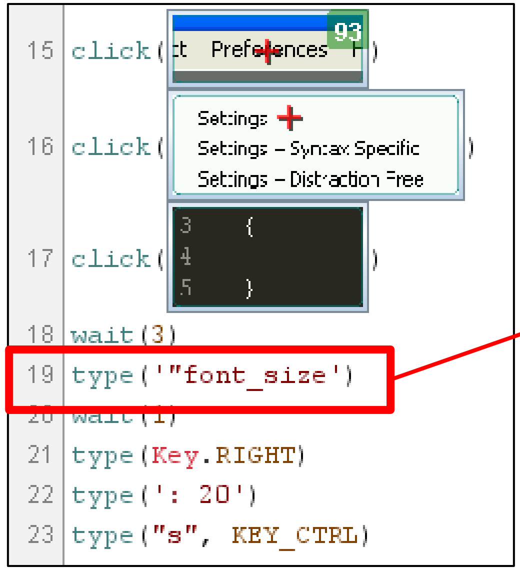
```
click( )
click( )
click( )
wait(3)
type('"font_size')
wait(1)
type(Key.RIGHT)
type(': 20')
type("s", KEY_CTRL)
```


untitled - Sublime Text (UNREGISTERED)
C:\Documents and Settings\User\Application Data\Sublime Text 3\Packages\User\Pref...
File
Edit
Selection
Find
View
Goto
Tools
Project
Preferences
Help
Preferences.sublime-settings | Default
Preferences.sublime-settings | User
Go
Details
Recycle Bin
start
CDROM (E:)
untitled - Sublime Tex...
C:\Documents and Se...
4:51 PM

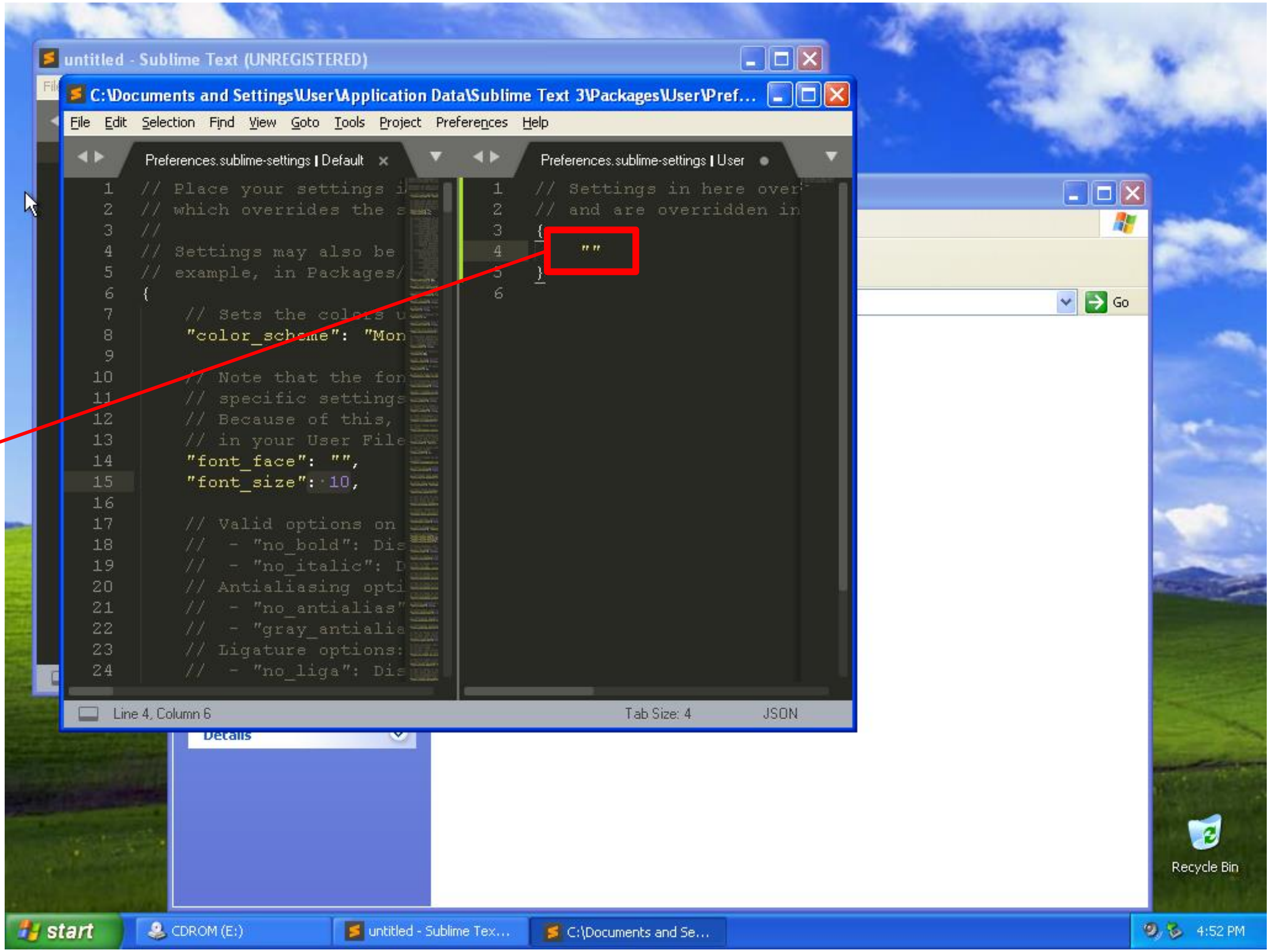
```
// Place your settings i
// which overrides the s
//
// Settings may also be
// example, in Packages/
{
    // Sets the colors u
    "color_scheme": "Mon

    // Note that the fon
    // specific settings
    // Because of this,
    // in your User File
    "font_face": "",
    "font_size": 10,

    // Valid options on
    //  - "no_bold": Dis
    //  - "no_italic": D
    // Antialiasing opti
    //  - "no_antialias"
    //  - "gray_antialia
    // Ligature options:
    //  - "no_liga": Dis
```

```
// Settings in here over
// and are overridden in
{

}
```

Line 4, Column 5   Tab Size: 4   JSON



```
click( )
click( )
click( )
wait(3)
type('"font_size')
wait(1)
type(Key.RIGHT)
type(': 20')
type("s", KEY_CTRL)
```

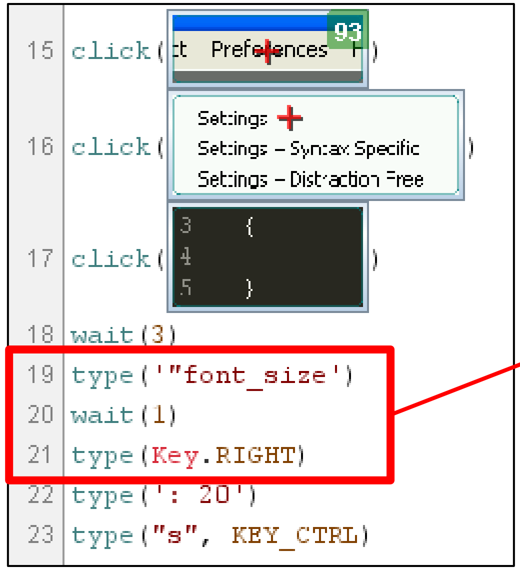


untitled - Sublime Text (UNREGISTERED)
C:\Documents and Settings\User\Application Data\Sublime Text 3\Packages\User\Pref...
File Edit Selection Find View Goto Tools Project Preferences Help
Preferences.sublime-settings | Default
Preferences.sublime-settings | User
Go
Details
Recycle Bin
start
CDROM (E:)
untitled - Sublime Tex...
C:\Documents and Se...
4:52 PM

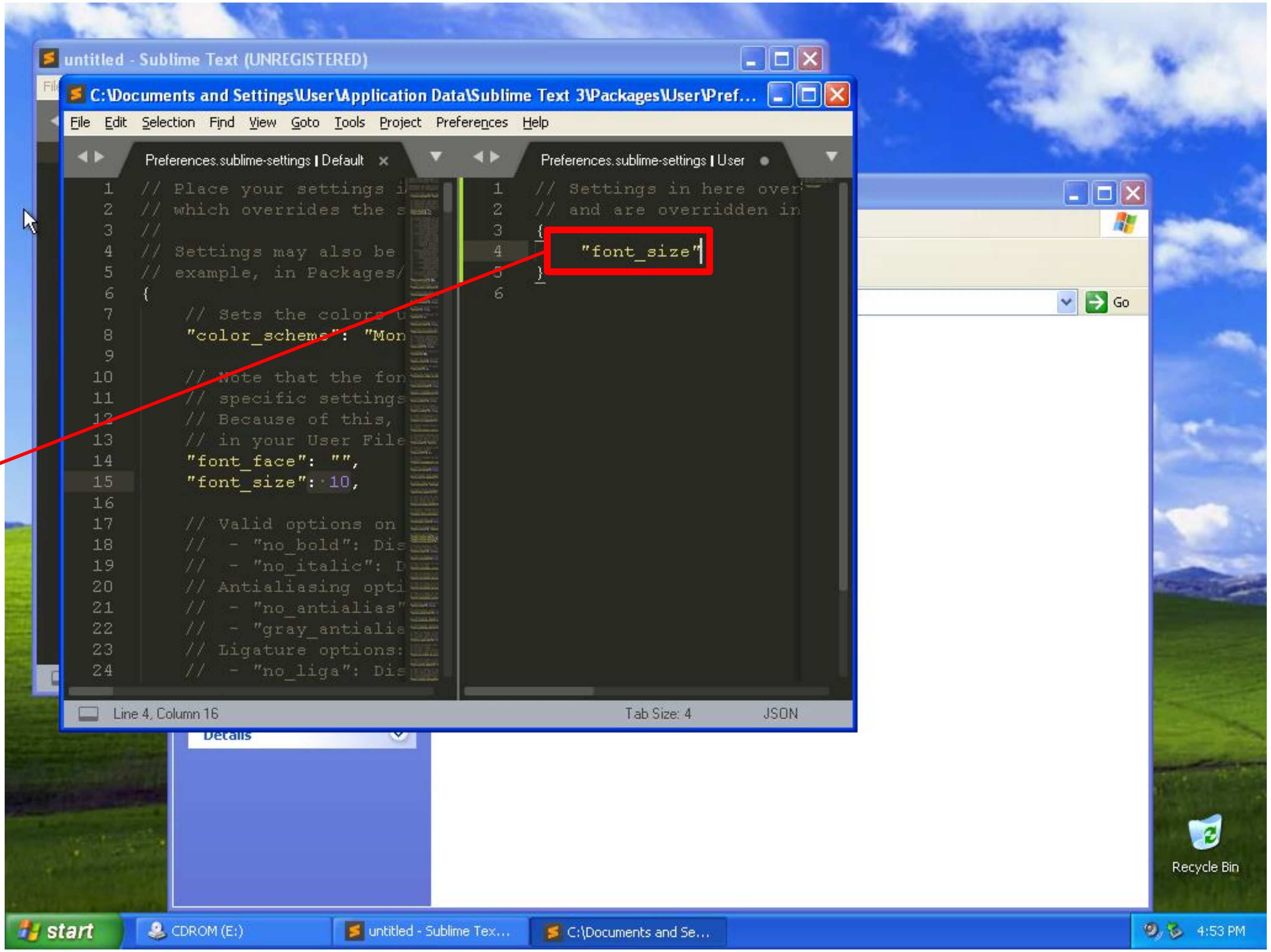
```
// Place your settings i
// which overrides the s
//
// Settings may also be
// example, in Packages/
{
    // Sets the colors u
    "color_scheme": "Mon

    // Note that the fon
    // specific settings
    // Because of this,
    // in your User File
    "font_face": "",
    "font_size": 10,

    // Valid options on
    //  - "no_bold": Dis
    //  - "no_italic": D
    // Antialiasing opti
    //  - "no_antialias"
    //  - "gray_antialia
    // Ligature options:
    //  - "no_liga": Dis
```

```
// Settings in here over
// and are overridden in
{
    ""
}
```

Line 4, Column 6 Tab Size: 4 JSON



```
click(  )
click(  )
click(  )
wait(3)
type('"font_size')
wait(1)
type(Key.RIGHT)
type(': 20')
type("s", KEY_CTRL)
```

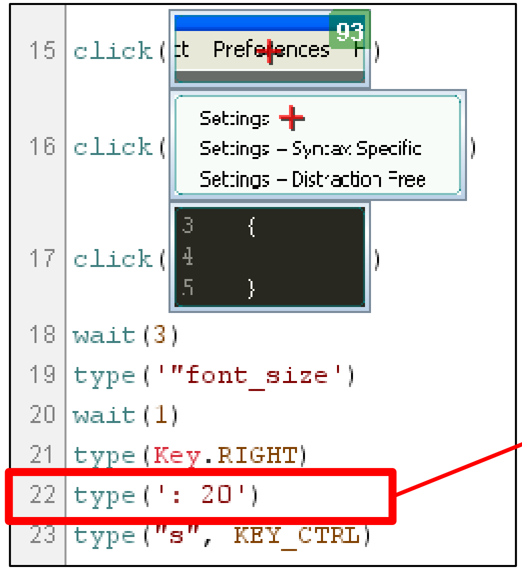


untitled - Sublime Text (UNREGISTERED)
C:\Documents and Settings\User\Application Data\Sublime Text 3\Packages\User\Pref...
File
Edit
Selection
Find
View
Goto
Tools
Project
Preferences
Help
Preferences.sublime-settings | Default
Preferences.sublime-settings | User
Go
Details
Recycle Bin
start
CDROM (E:)
untitled - Sublime Tex...
C:\Documents and Se...
4:53 PM

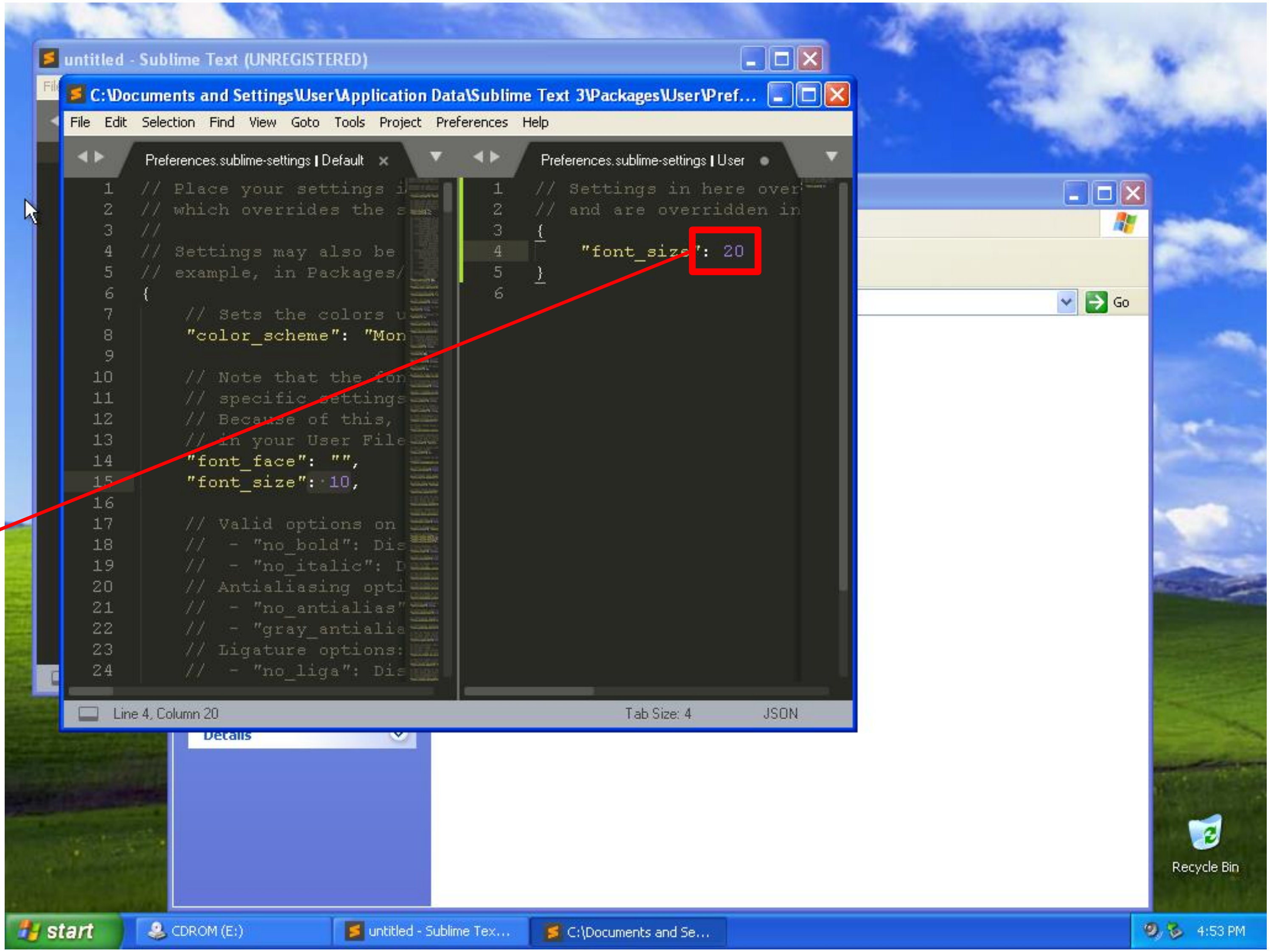
```
// Place your settings i
// which overrides the s
//
// Settings may also be
// example, in Packages/
{
    // Sets the colors u
    "color_scheme": "Mon

    // Note that the fon
    // specific settings
    // Because of this,
    // in your User File
    "font_face": "",
    "font_size": 10,

    // Valid options on
    //  - "no_bold": Dis
    //  - "no_italic": D
    // Antialiasing opti
    //  - "no_antialias"
    //  - "gray_antialia
    // Ligature options:
    //  - "no_liga": Dis
```

```
// Settings in here over
// and are overridden in
{
    "font_size"
}
```

Line 4, Column 16   Tab Size: 4   JSON

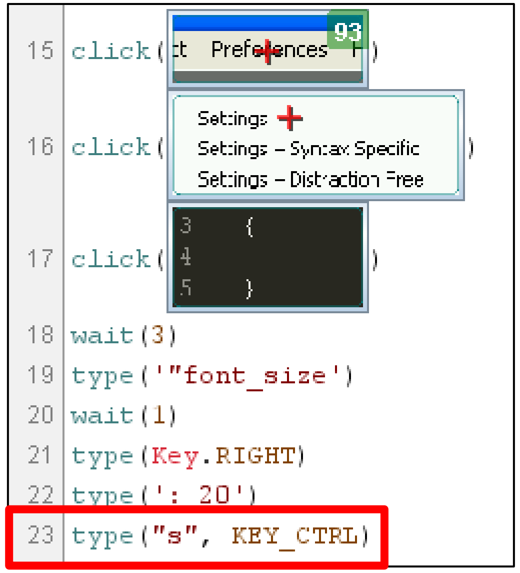


```
click(   )
click(   )
click(   )
wait(3)
type('"font_size')
wait(1)
type(Key.RIGHT)
type(': 20')
type("s", KEY_CTRL)
```

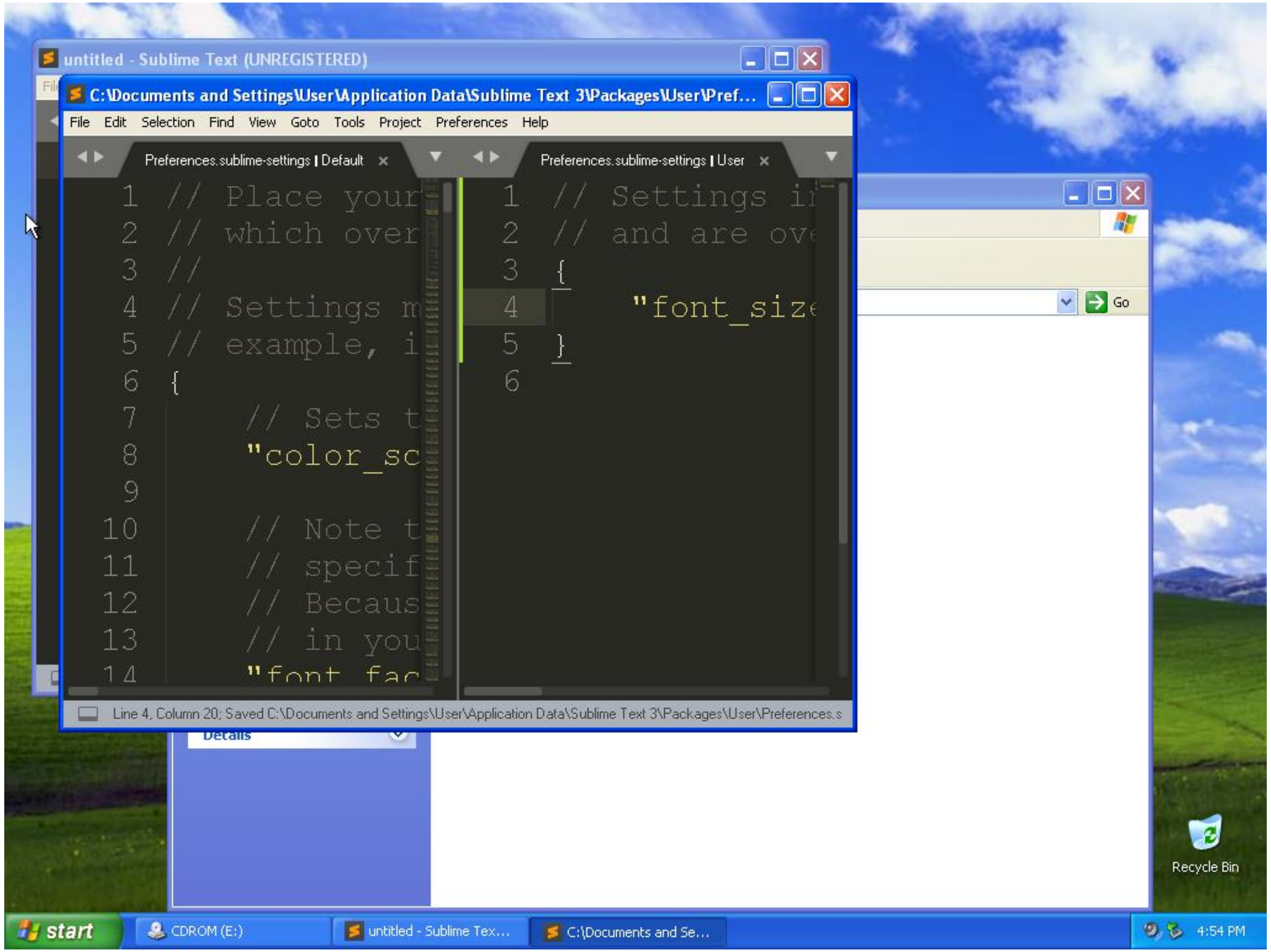

untitled - Sublime Text (UNREGISTERED)
C:\Documents and Settings\User\Application Data\Sublime Text 3\Packages\User\Pref...
File
Edit
Selection
Find
View
Goto
Tools
Project
Preferences
Help
Preferences.sublime-settings | Default
Preferences.sublime-settings | User
Line 4, Column 20
Tab Size: 4
JSON
Go
Details
Recycle Bin
start
CDROM (E:)
untitled - Sublime Tex...
C:\Documents and Se...
4:53 PM

```
// Place your settings i
// which overrides the s
//
// Settings may also be
// example, in Packages/
{
    // Sets the colors u
    "color_scheme": "Mon

    // Note that the fon
    // specific settings
    // Because of this,
    // in your User File
    "font_face": "",
    "font_size": 10,

    // Valid options on
    //  - "no_bold": Dis
    //  - "no_italic": D
    // Antialiasing opti
    //  - "no_antialias"
    //  - "gray_antialia
    // Ligature options:
    //  - "no_liga": Dis
```

```
// Settings in here over
// and are overridden in
{
    "font_size": 20
}
```



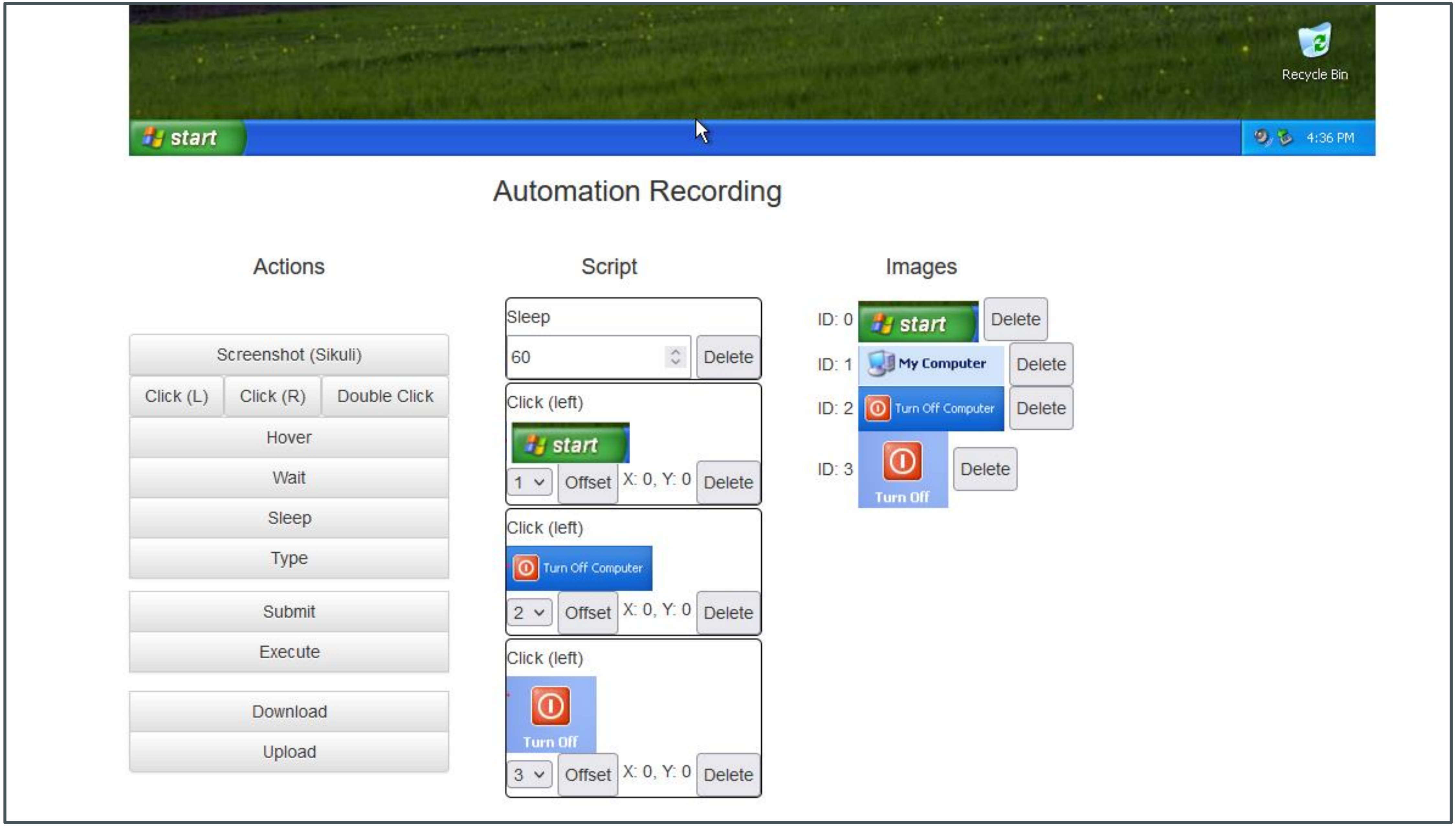
```
click( )
click( )
click( )
wait(3)
type('"font_size')
wait(1)
type(Key.RIGHT)
type(': 20')
type("s", KEY_CTRL)
```


untitled - Sublime Text (UNREGISTERED)
C:\Documents and Settings\User\Application Data\Sublime Text 3\Packages\User\Pref...
File
Edit
Selection
Find
View
Goto
Tools
Project
Preferences
Help
Preferences.sublime-settings | Default
Preferences.sublime-settings | User
Go
Details
Recycle Bin
start
CDROM (E:)
untitled - Sublime Tex...
C:\Documents and Se...
4:54 PM

```
// Place your
// which over
//
// Settings m
// example, i
{
    // Sets t
    "color_sc

    // Note t
    // specif
    // Becaus
    // in you
    "font_fac
```

```
// Settings i
// and are ove
{
    "font_size
}
```

Line 4, Column 20; Saved C:\Documents and Settings\User\Application Data\Sublime Text 3\Packages\User\Preferences.s



Automation Recording

Actions

Script

Sleep
60 Delete

Click (left)

1 Offset X: 0, Y: 0 Delete

Click (left)

2 Offset X: 0, Y: 0 Delete

Click (left)

3 Offset X: 0, Y: 0 Delete

Images

ID: 0 Delete

ID: 1 Delete

ID: 2 Delete

ID: 3 Delete

RESULTS

- Declaration, description and execution of user interaction
- Documentation of every single step necessary for a task
- Errors are (usually) easy to fix
- Sikuli best solution long-term? Again, we don't know (probably not)!

COMPARISON

Internal Automation

- Interacts via OS/Software interfaces
- Requires Modification of a system
- Automate software that supports OS Interface
- Deterministically know state of task
- Re-Use: Code as documentation, "Match-and-Mix"

External Automation

- Mimics human interaction
- External, can be applied to any existing system
- Any software
- Not deterministic, need to allow fail rate
- Re-Use: Suitable for assistance, step-by-step documentation

CONCLUSION

- Different automation approaches with strengths, weaknesses and use-cases
- Automation + Emulation = A step towards long-term re-useability of software
- Automation is Documentation!

Upcoming: Integration into EaaSI

Thank you for your attention!