Instituto Tecnológico de Buenos Aires

71.93 Principios de Informática 2023

Lesson Plan

Programming Tools

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1. Lesson Plan

Duration: 180 minutes (3 hours, including a 15-minute break)
Objective: Introduce students to various programming and productivity tools, including Bash, Batch scripting, regular expressions, Python, MATLAB, Git and GitHub, LaTeX and Overleaf, and AI Tools.

1.1. Setup and Introduction (10 minutes) - 14:00-14:10

1. Greet the students and provide an overview of the topics to be covered.
2. Explain the importance of these tools in programming and productivity.
3. Make sure to have the necessary materials for presentation ready to use.

1.2. Bash and Batch Scripting (30 minutes) - 14:10-14:40

1.2.1. Introduction to Bash scripting (20 minutes)

1. Explain the purpose of Bash scripting and its significance in automating tasks.
2. Teach basic navigation commands: `pwd`, `ls`, `cd`.
3. Teach basic scripting: creating a script, variables, user input, loops, conditionals.

1.2.2. Introduction to Batch scripting (10 minutes)

1. Explain the purpose of Batch scripting and its role in automating tasks on Windows.
2. Teach basic Batch commands, such as `echo`, `cd`, `dir`, `copy`, `move`, `del`.

1.3. Regular Expressions (15 minutes) - 14:40-14:55

1.3.1. Introduction to regular expressions (10 minutes)

1. Explain what regular expressions are and their applications in text manipulation.
2. Teach the basic syntax and metacharacters used in regular expressions.

1.3.2. Using regular expressions (5 minutes)

1. Demonstrate how to use regular expressions in RegExr site, showing examples of pattern matching and substitution.

1.4. Introduction to Python (40 minutes) - 14:55-15:35

1. Explain the advantages and applications of Python programming.
2. Teach basic syntax, variables, data types, and control flow constructs.
3. Show some examples of actual notebooks.

1.5. Break (15 minutes) - 15:35-15:50

1.6. Introduction to MATLAB (15 minutes) - 15:50-16:05

1. Explain the significance of MATLAB in scientific and engineering applications.
2. Teach basic syntax, variables, arrays, and common MATLAB functions.

1.7. Git and GitHub (20 minutes) - 16:05-16:25

1.7.1. Introduction to version control with Git (10 minutes)

1. Explain the purpose of version control and the benefits of using Git.
2. Teach fundamental Git commands: `clone`, `add`, `commit`, `push`, `pull`.

1.7.2. Introduction to GitHub (10 minutes)

1. Explain the role of GitHub as a remote repository for collaborative development.
2. Demonstrate how to create a repository, push code, and collaborate with others on GitHub.

1.8. LaTeX and Overleaf (15 minutes) - 16:25-16:40

1.8.1. Introduction to LaTeX (1 minute)

1. Explain the purpose of LaTeX in creating professional documents with mathematical notations.

1.8.2. Introduction to Overleaf (14 minutes)

1. Introduce Overleaf as an online LaTeX editor and collaboration platform.
2. Demonstrate how to create, edit, and share LaTeX documents using Overleaf.

1.9. AI Tools (15 minutes) - 16:40-16:55

1.9.1. Introduction to ChatGPT (5 minutes)

1. Introduce and show example of ChatGPT use.

1.9.2. Introduction to Copilot (5 minutes)

1. Mention Github Copilot and student plan, demostrating its use inside Visual Studio Code example.

1.9.3. Open Talk About AI (5 minutes)

1. Encourage students to share thoughts on AI becoming more popular.
2. Mention the importance of fact checking and the value function.

1.10. Conclusion (5 minutes) - 16:55-17:00

1. Recap the main points covered in the lesson.
2. Encourage students to explore further and provide additional resources or references.

2. Bash

Shell - surrounds the OS Kernel to hide details.
BASH: Born Again Shell
Usually default shell in UNIX systems (MacOS, Linux)
Running bash? `which $SHELL`
Also a programming language, which means anything we do in cmd line can be automated.
When launched, runs startup script `.bashrc`, `.bash_profile`

2.1. Useful links

- Video: Bash in 100 Seconds - Fireship
- Video: 60 Linux Commands in 10 Minutes - NetworkChuck
- Video: BASH scripting will change your life - NetworkChuck

2.2. Linux Commands

- `pwd`
- `ls` (-a, -l)
- `clear (ctrl+l)`
- `cd`
- `echo`
- `mkdir name`
- `touch name`
- `mv src dest`
- `cp src dest`
- `rm` (-r)
- `nano - ctrl+x, y, entr`
- `cat`
- pipelines |
- `ip address`
- `grep: ip address | grep eth0 | grep inet`
- `sudo, sudo apt update/upgrade/install`

2.3. Making a bash script

Create a file that ends with .sh or no extension `touch helloworld.sh`
First line should be a `#!` (shebang) followed by path to program that should run it `#!/usr/bin/bash`
Commands following will be interpreted line by line `echo "Hello World!"`

2.4. Variables

Creation: name → equal sign `GREET="Hello Andy!"`
Reference: $NAME `echo $GREET`
Variable equals command output: `user=$(whoami)`

2.5. Execute script

Make the script executable with `chmod u+x scriptname.sh`
`./helloworld.sh`

2.6. Arguments

Positional are assigned numbers
`./helloworld.sh Pablo Alex` → $1 = "Pablo", $2 = "Alex"

2.7. User Input and While loops

```
while true; do
    read -p "Would you like some ice cream?" yn
    case \$yn in
        [Yy]* ) break;;
        [Nn]* ) exit;;
        * ) echo "Please answer yes or no.";;
    esac
done
```

2.8. Conditionals

```
read -p "On a scale of 1 to 10, how funny are Pablo's memes? " appreciation
if [ \$appreciation -lt 10 ] ; then
    echo "You can come back when you learn to appreciate art."
else
    echo "I knew you were cool :)"
fi
```

3. Batch Files

3.1. DOS Commands

- dir
- tree
- cls
- cd
- echo (@echo off)
- md name
- rd name
- rmdir name, /s
- move
- type
- copy
- rename
- >, con, nul, file
- pause
- start

4. Regular Expressions

4.1. Useful links

- RegExr Website
- RegExr Website - Phone Number Example
- Video: Regular Expressions - Computerphile
- Video: Learn Regular Expressions In 20 Minutes - Wev Dev Simplified

4.2. Common metacharacters

- `Flags`
- `+`
- `?`
- `*`
- `.`
- `\`
- `\w, \W`
- `\s, \S`
- `\d`
- `{m, M}`
- `[ab], [a-z], [0-9]`
- `(a|A)`
- `^`
- `$`
- `?<=, ?<!, ?=, ?!`

5. Python

5.1. Useful links

- Python Website
- Visual Studio Code
- JetBrains Student License Application

5.2. Installing Python

Python Download Site

5.3. Creating a Venv

```
python -m venv {path_where_creating}\venv
Set-ExecutionPolicy -ExecutionPolicy RemoteSigned (optional)
venv\scripts\activate
python.exe -m pip install --upgrade pip
```

6. MATLAB

6.1. Useful links

- MATLAB Website
- MATLAB Support Documentation
- Octave

7. Git

7.1. Useful links

- Download Git
- GitHub
- GitHub Desktop

7.2. Most Common Commands

- clone - get repo
- fetch - update repo knowledge
- pull - get changes from remote
- add - add files to version control
- commit - consolidate changes locally
- push - upload changes to remote
- status - show local repo status
- branch - create another instance of content
- merge - join branches and fix possible issues
- rebase - join branches rewriting history linearly

8. LaTeX

8.1. Useful links

- LaTeX Project
- Overleaf
- Overleaf Documentation

8.2. Imágenes (Agregado a material P.C)

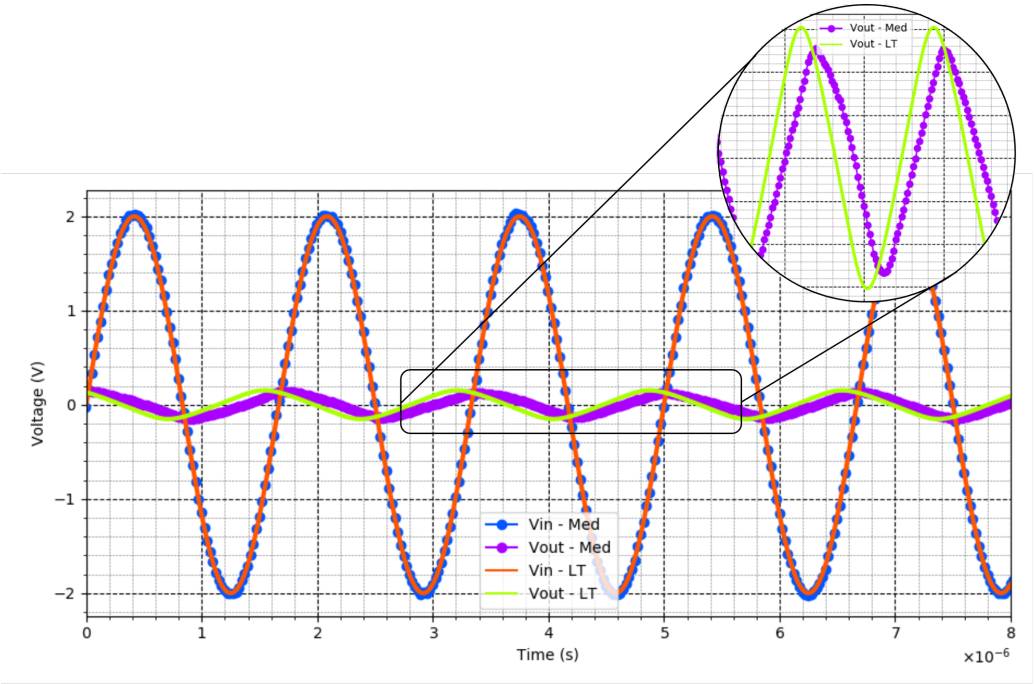

FIGURA 8.1: Visualización del Slew Rate - Caso 3

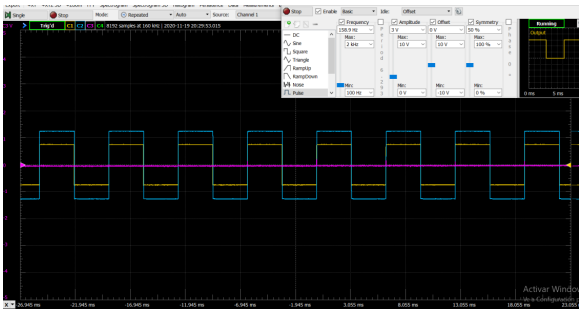

FIGURA 8.2: Frecuencia mínima - Rango de captura

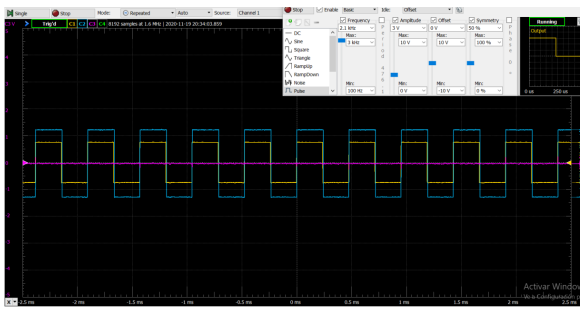

FIGURA 8.3: Frecuencia máxima - Rango de captura

9. AI Tools

9.1. Useful links

- ChatGPT
- GitHub Copilot
- Dall-E