COMS 6100 Class note

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A short quiz was given to test if the students really studied the linux commands. The answers to the quiz are

Q1. How do you create a directory named researchData?

A1. mkdir researchData

Q2. How do you delete an empty directory named researchData?

A2. rmdir researchData

Q3. How do you display information about what a command is and the different parameters that it will take?

A3. man "command"

Q4. How do you display information about what a command is, the different parameters that it will take, the history of the command, examples, ets.?

A4. "command" - -help

Q5. How do you display the contents of the current directory?

A5. ls

Q6. How do you duplicate file1 as file2?

A6. cp file1 file2

Q7. How do you make a directory named researchData the current directory (if researchData is in your current directory)?

A7. cd researchData

Q8. How do you rename a file named currentIdeas.txt to OldIdeas.txt?

A8. mv currentIdeas.txt OldIdeas.txt

Q9. How do you update the timestamp of a file named dissertationTopics.txt?

A9. touch dissertationTopics.txt

Q10. How do you wreak havoc and delete all files and directories that are in the current directory?

A10. rm -f *

After the quiz, a brief introduction of how the Linux operating system works (by distinguishing the graphical user interface and the terminal) was given by Dr. Carroll. The lecture is given in two parts.

1 Linux Commands

The following Linux commands are discussed:

1. man: This command shows the information and instructions on how a command is used. For example typing "man cd" in the terminal gives the information about the command "cd".

2. ls: This command is a short name for list directory. It is used to list the files and directories present in the current working directory. The syntax is "ls [option]". Some of the options used with the "ls" command include:

   - -a: list all files and directories (including hidden files and directories) in the current working directory.

   - -l: list all files and directories with their modification date and time. It also shows permission (of owner, group or other users) to read, execute or write on the files and directories. Also it gives a number named "total" which is the number of blocks which all the files and directories take up on the disk and this number is dependent on the operating system of the computer.

   - -al: This has the same function as the previous option except that all hidden files and directories are included.

   - -s: list by sorting files and directories by size.

   - -t: list by sorting files and directories by date and time.

   - -X: list by sorting all files and directories by extension name

3. cd: This command means change directory. It moves the user from a current working directory to the named directory. The syntax is "cd nameOfDirectory". For example "cd researchData/BiologyExperiments" (assuming BiologyExperiments is a directory in researchData directory which in turn is in the home directory and the user is currently in the home directory). The commands "cd" and "cd ~" can be used to return to the home directory from any working directory. While the command "cd ." denotes staying in the current directory, the command "cd .." is used to return to the parent directory of the current working directory.

4. touch: The "touch" command is majorly used to update the timestamp (date and time of the recent access and modification) of a file or directory and does not automatically erase the contents of existing files/directories with the same name. It is also used to create a new file. The syntax is "touch [options] fileName (or directoryName)". The various options include:

   - -a: changes only the access time of the file or directory.
   - -m: changes only the modification time of the file or directory.
   - -am: changes both the access and modification time.
   - -d: gives the option of creating a date of your choice. The "-d (option)" is followed by a string (the date) in single quotes. For example, touch -d "16 May 2016" researchData.

5. cp: This command is a short name for copy and is used to duplicate files and directories without erasing the content of the files. However, if the files have the same name the contents of the copied file is overwritten to the new file. The syntax of the command is "cp file newFile".

6. mv: This command is a short name for "move" and is used to rename or move files and directories. The syntax is "mv fileName newFileName". The command "mv * /home/researchData" will move all files and directories in the current working directory (including its contents) to /home/researchData.

7. rm: This is used to delete files and directories (with option -R for directories). Th syntax is "rm [options] fileName". Its opitions include:

   - -R: used to delete directories.
   - -f: force to remove files (-Rf for dirceties) whether the file is write-protected or not.
   - -i: prompts the user for confirmation before deleting the files and directories.

   The command "rm *" is used to delete all files and directories in the current working directory.

8. mkdir: This command is a short name for make directory and is used to create directories. If a directory name already exists an error message "cannot create directory 'xxx': File exists" is printed. The syntax is "mkdir directoryName".

9. rmdir: This is a short name for remove directory. It used to remove only empty directories and will print an error message if used to remove a directory with contents.

10. cat: The "cat" command is short for concatenation. It is used to read/display the contents of a file on the screen. The command "cat > fileName" is

used to create and write in a new file named "fileName". For existing files with contents (say MathLab), the command "cat >> MatLab" allows the user to write in MatLab. The command "cat file1 file2 file3" displays the contents of file1, file2 and file3 successively on the monitor.

11. more: This prints the content of a file one page (on the monitor) at a time. The tab key is used to view more contents.

12. less: This has the same function as the "more" command except that it allows scrolling backward through the file.

13. pwd: This command is a short name for print working directory. It prints the full path name of the current working directory.

14. *: This is a wild card character. It denotes everything in the current working directory. For example, "rm *" and "more *" removes and displays (respectively) all files and directories in the current working directory.

15. ! {command}: This executes the last use of the command "command". For example "! ls" displays the directories of the directory for which "ls" was last used.

16. !$: displays the last parameter on the previous line. If the last parameter is a command, it is displayed as well as executed.

17. which: This gives the pathname of a command.

18. echo: displays a line of text.

19. Useful Keys: some useful keys were discussed which includes:

    - Up and Down Keys: Goes to previous or next command already typed on the terminal. It serves as a short cut to avoid typing long strings over and over again.
    - Tab Key: This is used to complete a parameter in the terminal provided the parameter has been typed in previous commands. The asterisk * followed by a character(s) and then * will print files and directories whose names include the character(s). For example ls *i* will list all files and directories whose name includes i.

    Additional information on the Linux Commands can be found on Dr. Carroll's slides located at:
    https://www.cs.mtsu.edu/ hcarroll/6100/lectures/linuxCommands1/linuxCommands1.pdf

2   LaTeX

A brief introduction on how LaTeX differs from other word processing softwares was given and the emphasis were on the formatting, layout, visual display and the professionalism of the output given by LaTeX.

2.1 LaTeX Definition

The following are some given LaTeX definitions:

- LaTeX is a document markup language and document preparation system for TeX.

- Essentially a language consisting of macros for TeX.

- It is an excellent tool for writing scientific and mathematical papers.

2.2 Features of LaTeX

Some features of LaTeX were given and these includes:

- Typesetting journal articles, letters, technical reports, books, and slide presentations.

- Automatically numbers chapters, sections, subsections, equations, tables, figures etc. In essence it has a complete control over one's document.

- The most basic feature of LaTeX is in the typesetting of complex mathematical formulas, symbols and equations.

- Gives control over the choice of width and height of tables and figures.

- Automatic generation of bibliographies and indexes.

- Multi-lingual typesetting.

- Inclusion of artwork and process.

- creates a well formatted device independent (DVI) output and allows the output to be converted to other file format.

2.3 A Brief History of LaTeX

In 1977, Donald E. Knuth developed the TeX for typesetting text and mathematical formulas while the LaTeX was developed by Leslie Lamport in the early 1980s and pronounced "Lah-tech" or "Lay-tech". For more information, Dr. Carroll referred the students to the book "The Not so Short Introduction to LaTeX 2_ε" by Tobias Oetiker.
In writing a book in LaTeX, the author writes the content, the book designer designs the layout and the typesetter typsets the book.

3 Structure

LaTeX processes input files with a certain structure. The structure must follow

```
\documentclass[options]{...}
\begin{document}
...........................
\end{document}
```

The different documentclass options include the font (10pt, 11pt, 12pt) and the size (a4, a5, a6, etc) while the three dots denote the document type you which to write (article, book, letter, report, slides, memoir, beamer etc). Example of a LaTeX input is:

```
\documentclass[11pt]{article}
\title{My First \LaTeX Typing}
\author{Biala Toheeb A.}
\date{\today}
\begin{document}
H\' {e}llo {\bf Word!} \\
The heat equation in two dimension is given as
\begin{equation*}
\dfrac{\partial u}{\partial t} - \kappa \left(\dfrac{\partial u^2}{\partial ^2
x} + \dfrac{\partial u ^2}{\partial ^2 y}\right) = 0
\end{equation*}
\end{document}
```

Output:

<div style="text-align:center">

My First LaTeXTyping
Biala Toheeb A.
26th August, 2016.

</div>

Héllo **World!**
The heat equation in two dimensions is given as

$$\frac{\partial u}{\partial t} - \kappa \left(\frac{\partial u^2}{\partial^2 x} + \frac{\partial u^2}{\partial^2 y}\right) = 0$$

Several commands were also discussed which includes:

- \part{...}: Used in all document class except letters

- \chapter{...}: Used only in books and reports

- \subsection{...}: Used in all document class except letters

- \subsubsection{...}: Used in all document class except letters

- \paragraph{...}: Used in all document class except letters

- \subparagraph{...}: Used in all document class except letters

- \begin{itemize}
  \item ...
  \item ...
  \end{itemize}: This is used to list items with bullet pointdots.

- \begin{enumerate}
  \item ...
  \item ...
  \end{enumerate}: This is used to list items with numberings.

- \begin{equation} ... \end{equation} or $...$: They are used to write mathematical formulas, symbols and equations. While the former command centers and numbers the equation, the latter does not.

- \begin{figure} ... \end{figure}: To insert figures in a text. For example the text

  \begin{figure}[h]
  \centering
  \includegraphics[width = 0.25 \textwidth]{biala}
  \caption{Biala and his Mum}
  \end{figure}

  produces the output

Figure 1: Biala and his Mum

- \begin{tabular}... ... \end {tabular}: Used to draw tables. For example the text

```
\begin{tabular}{|c|c|c}\\
Students & Nationality & Date of Birth \\
\hline \\
Student1 & US & 08/26/2016\\
Student2 & US & 08/26/2016 \\
Toheeb & Nigeria & 08/26/2016\\
Student4 & China & 08/26/2016\\
Student5 & China & 08/26/2016\\
\caption{Students offering COMS 6100 in Fall 2016 }\\
\end{figure}
```

produces the output

Students	Nationality	Date of Birth
Student1	US	08/26/2016
Student2	US	08/26/2016
Toheeb	Nigerian	08/26/2016
Student4	China	08/26/2016
Student5	China	08/26/2016

Table 1: Students offering COMS 6100 in Fall 2016

Further reading could be done with the book "The Not So Short Introduction to LaTeX 2_ε: (Or LaTeX 2_ε in 157 minutes) or on Dr. Carroll's slides located at: https://www.cs.mtsu.edu/ hcarroll/6100/lectures/latex/latex.pdf.