language=C, basicstyle=, numbers=left, numberstyle=black, backgroundcolor=lightgray, showstringspaces=false, frame=double, captionpos=b, commentstyle=blue, keywordstyle=orange, stringstyle=red,

LaTeX Lab Handout

ITWS-2 Instructors
itws-2-instr@mailinglists.iiit.ac.in

February 3, 2012

Contents

Abstract

You need to submit a TEX source which when compiled using pdf LATEX (the command `pdflatex`), produces an exact copy of this PDF, **except the sections on passwordless ssh and the marking scheme**.

The only difference being that it should have your Name, Roll No. and Email in the author field, in place of ours, and the date of compilation (today) in the date field, if it differs from what's present in this file. Try to match the typesetting as closely as you can.

Each of the following carries marks:

1. Content
2. Text formatting
3. Document structure

This document has been typeset using the `article` documentclass, with paper dimensions `a4` and font size `10pt`.

The following packages have been used:

- `url` to display URLs
- `hyperref` to make links (including URLs) clickable
- `graphicx` to include images
- `listings` to include source code
- `xcolor` to get a variety of font colours, referrable by name (used in the source code listings)

Use the image at: `http://xkcd.com/149/` for Figure **??**

Consulting The Wikibooks guide to LATEX (link in the Online References section of the course website) should help.

Note: If you look closely, you'll see that this abstract has been generated using a special command, which is part of the article documentclass (it has a lesser font size and a smaller margin)! Find it.

Note: We have not used BIBTEX for the References. They are written in the `tex` file itself.

1 Typesetting Text

There are many different ways of embellishing text provided by LaTeX:

- **Bold Text**
- *Emphasized Text*
- *Slanted Text*
- Text in Small Caps
- `Text in Teletype Font`
- Text in the Serif Font
- Text in the Roman Font (default)

Notice that emphasized text is different from italicized text. *For example, this text is written in italics, but* these words are emphasized text. Also, this is normal text, but *this is emphasized text.*

The above is achieved using this:

```
\textit{For example, this text is written in italics, but
      \emph{these words are emphasized text}}. Also, this
      is normal text, but \emph{this is emphasized text}.
```

Text can be superscripted: *"Remember, Remember the 5^{th} of November!"*

The size of text can also be varied.

2 Typesetting Mathematics

Math can be typeset inline, for example: $a = b^2 + c$, or displayed separately as shown in the rest of this section.

Note: Do not get intimidated, there are simple commands for generating most of the symbols/structures shown below!

2.1 General Formulae

$$D = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

2.2 Calculus

$$\int_0^{+\infty} x^n e^{-x}\, dx = n!$$

2.3 Counting

$$ {}^nC_r = \binom{n}{r} = \frac{n!}{r!(n-r)!} $$

$$ {}^nP_r = \frac{n!}{(n-r)!} $$

2.4 Trigonometry

$$ \sin^2\theta + \cos^2\theta = 1 $$

2.5 Miscellaneous

$$ \vec{F} = m\vec{v} $$

$$ q = ms\Delta t $$

$$ \overline{(A \wedge B)} = \overline{A} \vee \overline{B} $$

3 Tables

Here is an elementary table:

#	Column 1	Column 2
1.	Notice that this column has a predefined width - 5.5cm	This one does not.
2.	These lines will help you understand.	These will too.
3.	There is an extra gap between rows "2." and "3.". You have to find a way to can get this gap.	Some text here.
4.	(No, you can't get the desired output by "leaving a row blank")	(Try it.)
5.	Tables which have minimal vertical lines are more readable than those with a large number of vertical lines	...

4 Creating your own commands/macros

This is a very powerful feature in LaTeX. For example, a qubit in quantum computing, $|\psi\rangle$, is written in LaTeX source as `$|\psi\rangle$`. Writing this everywhere is messy, so we define a new command (macro) in the document preamble:

```
\newcommand{\qubit}{$|\psi\rangle$}
```

Now, `\qubit{}` produces the same result as `$|\psi\rangle$`, which is $|\psi\rangle$. (This last instance of the qubit should be produced using a macro in your TeX source.)

5 Embedding images in your document

LaTeX also supports images. Use the `\includegraphics` command to include images in documents. Using the `\figure` environment, you can add captions to images.

Figure 1: xkcd: Sandwich. The width of this image is 3.5cm

6 Displaying Source Code

The `listings` package is used to display source code in a document. It is often convenient to define the parameters to listings in the preamble itself (e.g. if all code listings are in the same language.)

[caption=My C program!,label=lst:hello-world-c] include¡stdio.h¿ // My program int main() printf("Number Testera Number: "); int n; scanf("if(n¿=0) printf("positive"); else printf("negative");
The following are some of the main options which have been set globally for listings in this file, to get the desired effect in Listing **??**:

- `language=C` (source code language)
- `basicstyle=\footnotesize\ttfamily` (basic font style)
- `keywordstyle=\color{orange}`
- `commentstyle=\color{blue}\ttfamily`
- `numbers=left` (line numbers, and where to put them)
- `backgroundcolor=\color{lightgray}`

Try figuring out the rest of the options yourself. [**?**] should give you an idea of what is to be done.

7 Setting up Passwordless Logins with SSH

Note: *You don't have to include this section in your document. This section can be left out.*

`ssh` supports what is known as *key-based* authentication. It involves the generation of a key-pair, one of which is called the *private* key and the other the *public* key. These two fit together like pieces of a jigsaw puzzle. Each public key only matches with its private counterpart, and vice-versa.

Lets now go over the process of generating and using these keys for setting up `ssh` access without being queried for a password each time.

`harry` wants to setup passwordless access to a remote machine. Let us assume you are `harry`.

7.1 Generating a Key Pair

- execute the `ssh-keygen` command:

```
[harry@privetdrive ~]$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/home/harry/.ssh/id_rsa):
```

- When queried for the file, press enter (i.e. choose the default location).
- If your user doesn't have a `.ssh` directory, it will be created and you will get the following message:

```
Created directory '/home/harry/.ssh'.
```

- It will then ask you for a passphrase, which is used each time you want to use the key.

```
Enter passphrase (empty for no passphrase):
```

- Leave the passphrase empty (press enter) since our intent is to not be queried for anything at all.

```
Enter same passphrase again:
```

- After this, you should see output similar to the following:

```
Your identification has been saved in /home/harry/.ssh/id_rsa.
Your public key has been saved in /home/harry/.ssh/id_rsa.pub.
The key fingerprint is:
10:39:09:e0:77:ef:90:c8:9e:14:30:fd:6c:72:db:41 harry@privetdrive
The key's randomart image is:
+--[ RSA 2048]----+
|  +o...o         |
| . o. +.E        |
|  . oooo         |
|   o.+=+.        |
```

```
|    ++ooS.       |
|   o ..o.        |
|    o   .        |
|                 |
|                 |
+-----------------+
```

7.2 Using the Key Pair for passwordless SSH

Now that the key pair is generated, we need to setup things so that the public key is placed in a specific file on the remote machine (server) where you want to login, without being queried for a password. The private key must remain in the `~/.ssh` folder (default location where it was placed by `ssh-keygen`) for this to work.

- Suppose you have an account on a remote machine called `hogwarts`, with the same user id (`harry`). The following command will place your public key in the appropriate location on `hogwarts`.

```
[harry@privetdrive ~]$ ssh-copy-id harry@hogwarts
The authenticity of host 'hogwarts (256.256.256.256)'
can't be established.
RSA key fingerprint is
47:18:e3:f6:d6:ea:b9:58:96:96:04:74:9f:6c:1c:fe.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'hogwarts,256.256.256.256' (RSA)
to the list of known hosts.
harry@hogwarts's password:
```

- When queried, enter your password.
- You will see a message similar to the one below:

```
Now try logging into the machine, with "ssh 'harry@hogwarts'",
and check in:

  ~/.ssh/authorized_keys

to make sure we haven't added extra keys that you weren't expecting.
```

- Your setup is complete.

Voila! `harry` should now be able to enter `hogwarts` without a password!

8 Marking Scheme

Note: *You don't have to include this section in your document. This section can be left out.*

8.1 Typesetting text - 3 marks

- **2 marks** for different text styles.
- **1 mark** for sub/superscripts and font size.

8.2 Typesetting Mathematics - 3 marks

- Sections 2.1 to 2.4 - **0.5 marks** each.
- Section 2.5 - **1 mark**.

8.3 Tables - 3 marks

- **1 mark** for width of 5.5cm for Column 1 in first table.
- **1 mark** for a gap of 50pt between row 2 and row 3.
- **0.5 marks** for the double horizontal lines (at the top and bottom)
- **0.5 marks** for the single horizontal lines.

8.4 Macro - 1 mark

1 mark for proper definition and use of the macro.

8.5 Image - 3 marks

- **1 mark** for including the image.
- **1 mark** for the caption.
- **1 mark** for centering.

8.6 Listings - 3 marks

3 marks for the look, language, colours, line numbering, fonts, etc.

8.7 Passwordless SSH

4 marks Demonstrating passwordless login from your lab machine to web.
Please unset it before leaving.

References

[1] LaTeX Tutorials, a Primer, *Indian TEX Users Group (TUG India)*, TUG India, 2002-2003

[2] The Not So Short Introduction to LaTeX 2_ε, OR, LaTeX 2_ε in 157 minutes, *Oetiker T., Hyna I. and Schlegl E.*, Version 5.01, April 6, 2001

[3] The Comprehensive LaTeX Symbol List, *Scott Pakin*, 2009

[4] LaTeX/Packages/Listings - Wikibooks, open books for an open world, `http://en.wikibooks.org/`