Booth Research Center (BRC) Seminar

# $IAT_EX:$ A Document Preparation System

October 7, 1997

# Presentation Outline

#### • Set-up

- Structure of the LAT<sub>E</sub>X file
- Style options
- Basic topics
  - Character set and Fonts
  - Sectioning and Paragraphs
  - Footnotes and Bibliography
- Environments
  - List and Math environments
  - Figure and Table
  - Tabular and Array
  - Picture
- More advanced topics
  - File types and locations
  - Macros
  - File handling
  - Output-effecting commands
- How to process  $\mathbb{P}T_EX$  files

# Structure of the ${\rm I\!A\!T}_{\rm E\!X}$ File

At the highest level:

- the preamble
  - document style
  - point size
  - -twoside, twocolumn
  - title information
  - page style parameter initialization
- the document
  - sectioning
  - everything else

# The Document Class Command

- Command/Macro: \documentclass[options]{class}
- Document classes (*class*)
  - article
  - report
  - book
  - letter
  - slides
- Options (options)
  - optional, leave out brackets if not used
  - options are separated by commas, no spaces inside square brackets
  - possible options:
    - \* Alternate pointsize ('10pt', '11pt' or '12pt') [Default = 10point]
    - \* Text layouts ('twoside' and/or 'twocolumn') [Default = single - column, single - sided]
    - \* Equation layouts ('leqno' and/or 'fleqn')
- Examples:

```
\documentclass{article}
\documentclass[12pt]{article}
\documentclass[twocolumn]{book}
\documentclass[12pt,twoside]{article}
\documentclass[11pt]{report}
\documentclass[12pt,twoside,twocolumn]{report}
```

### Packages

- Command/Macro: \usepackage[options]{pkgs}
- Packages (pkgs) A list of packages to be loaded
- The standard packages include:
  - graphics
  - graphpap
  - color
  - ifthen
  - latexsym
- Options (options)
  - optional, leave out brackets if not used
  - options are separated by commas, no spaces inside square brackets
  - putting an option in the \documentclass command effectively adds that option to any package loaded with \usepackage
- Examples:

```
\documentclass[12pt]{article}
```

```
\verb|usepackage{uconnthesis}|
```

# The Document Style Command \*

- Command/Macro: \documentstyle[*options*]{*doc\_style*}
- Document styles (*doc\_style*)
  - article
  - report
  - book
  - letter
- Options (options)
  - optional, leave out brackets if not used
  - options are separated by commas, no spaces inside square brackets
  - possible options:
    - \* Alternate pointsize ('11pt' or '12pt')
      [Default = 10point (Note: there is no '10pt' option)]
    - \* Text layouts ('twoside' and/or 'twocolumn') [Default = single - column, single - sided]
    - \* Equation layouts ('leqno' and/or 'fleqn')
    - \* Auxilary style files (e.g. uconnthesis)
- Examples:

```
\documentstyle{article}
\documentstyle[12pt]{article}
\documentstyle[twocolumn]{book}
\documentstyle[12pt,twoside]{article}
\documentstyle[11pt,uconnthesis]{report}
\documentstyle[12pt,twoside,twocolumn]{report}
```

<sup>\*</sup>This is the old version  ${\rm I\!A}T_{\rm E}\!X$  2.09

# The Title Page

You can automatically generate a title/title-page if you use the following with the 'article' or 'report' styles:

- \title{*your-title*}
- $\operatorname{author}_{\operatorname{author}_1 \setminus \operatorname{thanks}} \{ Supported \ by \ X \} \ \operatorname{author}_2 \ \ldots \ \}$
- \date{ date associated with document}

Example:

```
\title{The Effect of On-Campus Cable-TV\\ on Student's
Grades}
\author{Dr. John Smith \thanks{This work partially
funded by UCONN Grant \#123-212-423} \and Dr. Jane
Jones\thanks{This work partially funded by PGY Grant
H03894322}}
\date{October 7, 1997}
```

# The Effect of On-Campus Cable-TV on Students' Grades

Dr. John Smith<sup>\*</sup> Dr. Jane Jones<sup>†</sup>

October 7, 1997

This work partially funded by UCONN Grant #123-212-423 This work partially funded by PGY Grant H03894322

Preamble

# Other Preamble Commands

- Page styles (\page\_style{ page\_style} & \thispagestyle{ page\_style})
  - plain the default
  - $\tt empty$  nothing in header and footer
  - headings contents of header and footer determined by document style
  - myheadings
    - \* same as 'headings' but can specify left and/or right headings
    - \*  $\operatorname{markright}{right\_head}$
    - \*  $\operatorname{\mathsf{head}} \{ right\_head \}$
  - others (may be supplied by document style options)

For example,

```
\markboth{Introduction to \LaTeX}{Preamble}
\pagestyle{myheadings}
\thispagestyle{empty}
```

- Style parameters
  - Margins (\oddsidemargin, \evensidemargin & \topmargin)
  - Body dimensions (\textheight and \textwidth)
  - Use  $\$  etlength or  $\$  better to set parameters.

For example,

# Page style parameters

| <br>  |  | 1 inch  |
|---|--|---|
| İ   | Г  | headheight HEADER   |
|   |  | t \headsep  |
| 1 inch  <br> <br> <br> <br> <br> <br> <br> <br> | $ \begin{array}{c} & & \bullet \\ & \bullet \\ & & \bullet \\ & & \bullet \\ & & & \bullet \\ & & & &$ | ↓<br>\textwidth \textheight   |
|   |  | BODY  |
|   |  | $ \begin{array}{ c c c } & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & \\ & & & & & & $ |
|   | L  | †\footskip  |
|   |  | Vootheight FOOTER   |

Introduction to  $\[Mathebaareftee]{MTEX}$ 

Page style parameters (cont.)

• Default values of "article" and "report" style parameters

|   | Fo  | ont size (72pt=1                                  | in)  |
|---|---|---|--|
| Parameter   | $10 \mathrm{pt}$                                  | $11 \mathrm{pt}$                                  | $12 \mathrm{pt}$                                     |
| \baselineskip                                     |   | 12 pt (1/6 in)                                    |  |
| $\setminus$ topmargin                             |   | 27 pt (3/8 in)                                    |  |
| ackslashheadheight                                |   | $12 \mathrm{pt}$                                  |  |
| $\headsep$  |   | $25 \mathrm{pt}$                                  |  |
| $\setminus \mathbf{footskip}$                     |   | $30\mathrm{pt}$                                   |  |
| $\backslash {f footheight}$                       |   | 12pt  |  |
| $\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $          | 43*\baselineskip                                  | 38*\baselineskip                                  | 36*\baselineskip                                     |
| $\setminus textwidth$                             | 345 pt (4.8 in)                                   | $360 \mathrm{pt} (5 \mathrm{in})$                 | 390 pt (5.4 in)                                      |
| $\oldsymbol{demargin}$ (1-sided)                  | $63 \text{pt} \left(\frac{7}{8} \text{in}\right)$ | $54 \text{pt} \left(\frac{3}{4} \text{in}\right)$ | $39.5 \text{pt} \left(\frac{9}{16} \text{in}\right)$ |
| $\backslash oddsidemargin (2-sided)$              | 44pt  | $36\mathrm{pt}$                                   | 21pt   |
| $\ensuremath{\setminus evensidemargin}$ (1-sided) | 63pt  | $54 \mathrm{pt}$                                  | $39.5 \mathrm{pt}$                                   |
| $\ensuremath{\setminus evensidemargin}$ (2-sided) | 82pt  | $74 \mathrm{pt}$                                  | 59pt   |
| \columnsep  |   | 10pt  |  |
| $\backslash$ columnwidth                          | (\text  | $\overline{width + \langle columns \rangle}$      | <b>ep</b> ) / 2                                      |

• Default values of the "**book**" style parameters

|   | Fo               | nt size (72pt=1                | lin)             |
|---|------------------|--------------------------------|------------------|
| Parameter   | $10 \mathrm{pt}$ | $11 \mathrm{pt}$               | $12 \mathrm{pt}$ |
| $\begin{tabular}{lllllllllllllllllllllllllllllllllll$ |                  | 12pt                           |                  |
| $\setminus topmargin$                                 | 0.75in           | 0.73in                         | 0.73in           |
| $\headheight$   |                  | $12 \mathrm{pt}$               |                  |
| $\headsep$  | 0.25in           | 0.275in                        | 0.275in          |
| ackslashfootskip                                      | 0.35in           | 0.38in                         | 0.41in           |
| ackslashfootheight                                    |                  | $12 \mathrm{pt}$               |                  |
| $\textheight$   | 41\baselineskip  | 38\baselineskip                | 36\baselineskip  |
| $\textwidth$  | 4.5in            | 5in                            | 5in              |
| <b>\oddsidemargin</b>                                 | 0.5in            | 0.25in                         | 0.25in           |
| evensidemargin  | 1.5in            | 1.25in                         | 1.25in           |
| \columnsep  |                  | $10\mathrm{pt}$                |                  |
| $\columnwidth$  | (\textv          | ${f vidth+\backslash columns}$ | <b>sep</b> ) / 2 |

Introduction to  $\[Mathebaar]{PTEX}$ 

Seminar

#### Basics

### The Document

• The body of the document is surrounded by:

```
\begin{document}
```

 $\exists body$ 

```
\verb+ end \{ \texttt{document} \}
```

• To automatically format the title (if defined in preamble) type:

\maketitle

immediately after the '\begin{document}'.

### Overall document file format

The resulting  ${\rm I\!A} T_{\rm E} X$  file format is as follows:

```
\class{ class}
```

 $\vdots$  preamble

\begin{document}

#### Basics

### Input Characters

The following characters can be used in the input:

- upper and lower case alphabetics
- numeric characters
- special characters . : ; , ? ! ' ' ( ) [ ] / \* @
- other special characters:
  - type \**#** to get #
  - type \\$ to get \$
  - type % to get %
  - type \& to get &
  - type  $\_$  to get \_
  - type  $\setminus \{$  to get  $\{$
  - type  $\setminus$  to get }
  - characters used mainly in math mode (delimited by \$'s):

    - \* type  $\lambda = a$
    - \* type  $\lambda a$  to get  $\hat{a}$
    - \* type \$+\$ to get +
    - \* type **\$=\$** to get =
    - \* type \$|\$ to get |
  - Others (see [LAMP86])

# Fonts

| $\mbox{rm}$     | Roman      | This is an example of Roman      |
|-----------------|------------|----------------------------------|
| \bf             | Bold       | This is an example of Bold       |
| $\backslash sf$ | San Serif  | This is an example of San Serif  |
| ∖it             | Italic     | This is an example of Italic     |
| $\mathbb{E}$    | Emphatic   | This is an example of Emphatic   |
| $\sl$           | Slanted    | This is an example of Slanted    |
| $\backslash sc$ | Small Caps | This is an example of Small Caps |
| $\t$            | Typewriter | This is an example of Typewriter |

# Type Size

| \tiny         | This is tiny         |
|---------------|----------------------|
| \scriptsize   | This is scriptsize   |
| \footnotesize | This is footnotesize |
| \small        | This is small        |
| $\normalsize$ | This is normalsize   |
| \large        | This is large        |
| \Large        | This is Large        |
| \LARGE        | This is LARGE        |
| \huge         | This is huge         |
| \Huge         | This is Huge         |

### Sectioning

The following is a list of the sectioning commands:

- 1.  $\operatorname{part}{title}$
- 2.  $\langle chapter{title} \rangle$  (Not in 'article' style)
- 3.  $\section{title}$
- 4.  $\forall subsection{title}$
- 5.  $\subsubsection{title}$
- 6.  $\paragraph{title}$
- 7.  $\subparagraph{title}$

For example:

 $\section{Related work}$ 

Comments:

- 1. The order listed is the order in which these commands must be used, i.e. the 'subsection' command must be used inside a section, not immediately following a 'chapter' command.
- 2. The 'part' command is optional.

# Paragraphs

Paragraphing is accomplished by leaving a completely blank line in the input file. A commented out line is not effectively a blank line.

### Spacing

- Vertical  $\ vspace{length}, \ \ vspace{length}$

 $LAT_EX$  insists on removing white space when it ocurrs at the beginning or end of a line, paragraph or page. The '\*'-forms can be used to force  $LAT_EX$  to leave the white space alone.

# Footnotes

• Footnotes are created by using the command

```
\footnote{ the-footnote }
```

• Example:

 $\label{eq:unix} \begin{array}{l} \text{Unix} is a trademark of AT \ & T \\ \text{is to academia} \\ \text{what } VMS \ footnote \\ \{VMS \ is a trademark of Digital Equipment \\ Corp. \\ \} \ is \ to \ industry. \end{array}$ 

 $Unix^1$  is to academia what VMS<sup>2</sup> is to industry.

<sup>&</sup>lt;sup>1</sup>Unix is a trademark of AT&T

 $<sup>^2\</sup>mathrm{VMS}$  is a trademark of Digital Equipment Corp.

# Page numbering

- To set page number: \setcounter{page}{N}
- To increment page number: \addtocounter{page}{N}
- To set page number style: \pagenumbering{pnum\_style}

| $pnum\_style$ | Meaning                 | Example |
|---------------|-------------------------|---------|
| arabic        | Arabic numbering        | 15      |
| Roman         | Uppercase Roman letters | XV      |
| roman         | Lowercase Roman letters | XV      |
| Alph          | Uppercase letters       | 0       |
| alph          | Lowercase letters       | 0       |

• Remember, page number refers to *current* page number

### Cross References

To cross reference a (sub)section in your document, use the '\label' command right after the sectioning command.

```
\label{messy algorithm} or \label{fig:layout}
```

Reference the label via the ' $\ref$ ' command.

```
ref\{messy algorithm\} or \ref\{fig:layout\}
```

Cross-referencing tables and figures will be explained in later slide.

#### Environments

- Blocks are called "environments" (or "groups") and are denoted by:
  - \* the characters '{' and '}'
- Changes to parameters (e.g. \parindent, \textwidth, etc.) and macro definitions made within an environment hold only inside that environment. When exitted, the old values are restored.
- $\begin{name} name \ starts an environment \$ 
  - begins a group
  - calls the macro  $\backslash name$
- $\backslash$  end { name } ends an environment

  - makes sure name is defined and not ended yet; if not, prints an error message
  - calls the macro  $\backslash$ end name
- Defining new environments in  ${\rm LAT}_{\rm EX}$ 
  - New environment:  $\newenvironment{name}[#]{<Beg>}{<End>}$
  - Redefining:

- [#-of-parms] is the number of parameters  $(1 \rightarrow 9; \text{ optional})$
- < Beg> is the commands to evaluate at the start of the environment
- $\langle End \rangle$  is the commands to evaluate at the end of the environment

# List-making Environments

- There are three list environments:
  - itemize
  - enumerate
  - description
- You are allowed a maximum depth of four list environments

# An 'itemize'd List

The format of the itemize command is as follows:

```
\begin{itemize}
   \item text ...
   :
   \item text ...
\end{itemize}
```

Examples of itemize and nested itemize are evident throughout this hand-out.

Environments

# An 'enumerate'd List

Enumeration is accomplished as follows:

```
\begin{enumerate}
    \item text ...
    :
    \item text ...
\end{enumerate}
```

The following is an example of enumeration:

- 1. New England Cities
  - (a) Massachusetts
    - i. Boston
    - ii. Plymouth
    - iii. Springfield
  - (b) Rhode Island
    - i. Newport
  - (c) Connecticut
    - i. Hartford
    - ii. New London
- 2. Mid-Atlantic Cities
  - (a) New York
    - i Buffalo
  - (b) New Jersey
    - i. Trenton
    - ii. Princeton
  - (c) Pennsylvania
    - i. Harrisburg
    - ii. Philadelphia
    - iii. Pittsburg

# A list of 'desciption's

Description is accomplished as follows:

```
\begin{description}
   \item[descriptor] ...
   :
    iitem[descriptor] ...
   \end{description}
```

Example of the description environment follows:

```
\begin{description}
\item[CGA] Computer Graphics Adaptor
\item[VGA] Video Graphics Array
\item[$\beta$] The Greek letter beta
\item[$\Sigma$] The upper--case Greek letter sigma
\item[\parbox{.5 in}{\em red}] The color of roses
\item[\parbox{.5 in}{\tt blue}] The color of the sky
\end{description}
```

 $\mathbf{CGA}\quad \mathrm{Computer}\ \mathrm{Graphics}\ \mathrm{Adaptor}$ 

VGA Video Graphics Array

 $\beta$  The Greek letter beta

 $\Sigma$  – The upper–case Greek letter sigma

*red* The color of roses

blue The color of the sky

### Getting into Math Mode

The following can be used to enter math mode:

- \begin{math} ... \end{math}
  - generates *in-text* or *in-line* formulae
  - shortform:  $\$ \dots \$$
  - shortform:  $(\ldots)$
  - Example:  $\sum_{i=0}^{n} x_i = \int_0^1 f$
- $\begin{displaymath} ... \end{displaymath}$ 
  - generates unnumbered, displayed formulae
  - shortform:  $\[\] \[\]$
  - Example:

$$\sum_{i=0}^{n} x_i = \int_0^1 f$$

- $\begin{equation} \ldots \end{equation}$ 
  - generates numbered displayed formulae
  - Example:

$$\sum_{i=0}^{n} x_i = \int_0^1 f \tag{1}$$

- $[\ldots], (\ldots)$  and  $\ldots$  are full-fledge environments.
- The \documentstyle option 'leqno' causes equation numbers to appear on the left-hand side.

# Mathematical Formulas

Subscripts and superscripts:

| $x^{2y}$  | $x^{2y}$          |
|-----------|-------------------|
| $x_i^2$   | $x_{i}^{2}$       |
| $x^{y^z}$ | $x^{z} \{y^{z}\}$ |

Fractions:

| · · · · · ·               |  |
|---------------------------|--|
| $x = \frac{y+z}{u^2+z^2}$ | $\ x = \frac{y+z}{y^2+z^2} $   |
| y-+2-                     |  |
| $\frac{z+y}{2}$           | $\Phi$ \ free (\ free ( - + ) [2] ) [- + ^2] $\Phi$  |
| $x = \frac{z}{z+y^2}$     | $ \Rightarrow x = \frac{1}{2}  |

Math Symbols and Greek Letters:

| $\cap$    | $\langle cap$ | Σ |
|-----------|---------------|---|
| U         | \cup          | Ι |
| $\subset$ | \subset       | ſ |
| $\supset$ | \supset       | С |
| $\leq$    | ∖leq          | 1 |
| $\geq$    | \geq          | 6 |
| $\neq$    | \neq          | < |
| $\equiv$  | \equiv        | ( |
| $\in$     | \in           |   |

| $\sum$       | $\sum$          |
|--------------|-----------------|
| П            | \prod           |
| ſ            | $\setminus$ int |
| $\propto$    | \propto         |
| ١٨           | \preceq         |
| *            | \clubsuit       |
| $\diamond$   | diamondsuit     |
| $\heartsuit$ | heartsuit       |
|              | $\spadesuit$    |

| $\alpha$   | \alpha        |
|------------|---------------|
| $\epsilon$ | \epsilon      |
| $\varphi$  | \varphi       |
| $\sigma$   | $\sigma$      |
| $\pi$      | \pi           |
| $\omega$   | \omega        |
| Σ          | <b>\Sigma</b> |
| Λ          | \Lambda       |
| Ω          | \Omega        |

There are many more symbols, Greek letters and other equation-formating macros available. See [LAMP86] (chapter 3) for a complete list.

### Figures and Tables

- Single-column figure/table ( $width_of\_body = \textwidth or \columnwidth$ )
  - \begin{figure}[loc] body \end{figure}
  - $\begin{table}[loc] body \end{table}$
- Double-column figure/table ( $width_of\_body = \textwidth$ )
  - \begin{figure\*}[loc] body \end{figure\*}
  - $\begin{table*}[loc] body \end{table*}$
- To include a caption, use:

#### \caption[lst\_entry]{caption}

where  $lst\_entry$  generates the entry in the list of figures or tables and *heading* is the text of the caption. The caption will appear in the figure/table where the command is used. (i.e., if used just after '\begin{...}', the caption will appear at the top of the table/figure.)

- To cross reference a figure or table, use '\label' command \*AFTER\* the caption command.
- **NOTE:** The 'table' environment and 'tabular' environment (to be discussed later) are two different types of environments. They are \*not\* interchangable.

| loc          | Position  |
|--------------|---|
| h            | position the figure or table <b>here</b>                          |
| $\mathbf{t}$ | position the figure or table at the $\mathbf{top}$ of a text page |
| b            | position the figure or table at the <b>bottom</b> of a text page  |
| р            | position the figure or table on a separate <b>page</b> containing |
|              | no text, only figures and tables                                  |
|              |   |

Figure 1: Possible letters composing *loc* 

## The Tabular Environment

The following commands generate tabular output:

- \begin{array}[pos]{cols} rows \end{array}
- \begin{tabular}[pos]{cols} rows \end{tabular}
- \begin{tabular\*}{wdth}[pos]{cols} rows \end{tabular\*}

where *pos* is:

 $\mathbf{t}$  to align on top row

 $\mathbf{b}$  to align on bottom row

default is align on center of row

*cols* specifies the column formatting:

| cols      | Format                                      |
|-----------|---|
| 1         | left-aligned items                          |
| r         | right-aligned items                         |
| С         | centered items                              |
|           | produces a vertical line between columns    |
| $p\{wd\}$ | typeset as a single paragraph of width $wd$ |

wdth specifies the width in the tabular\* environment.

#### NOTE:

- 1. The **array** environment formats its column items in a math environment while the **tabular** environment formats its column' items in a paragraph environment.
- 2. The table and figure environments defines a group of '*floating*' text (i.e. text floats to top or bottom of the page) while the tabular environment is used to generate tabulated output.

## Defining the Rows in *array* and *tabular*

Rows consist of the following:

- each row consists of column items separated by '&'s
- rows of text are separated by '\\'s.
- \multicolumn{num}{col}{item} causes item to span num columns, with positioning specified by col.
- \hline horizontal line across the entire table
- $\cline{x, y}$  a horizontal line across table columns x thru y

Example ('table' and 'tabular' environments)

```
\begin{table}[h]
  \centering
  begin{tabular}{|1||r|1|1}
    \hline
    \multicolumn{4}{|c|}{{\bf Rabbit Report}} \\ \hline
                   & \multicolumn{2}{c|}{Breeding Dates}\\ \cline{3-4}
             &
             & Age & \multicolumn{1}{|r|}{Last} & Next \\ \hline \hline
    Name
             & 1 & Sept & March \\ \hline
    Pepper
    Princess & 4
                   & Nov & Dec \\ \hline
                   & Oct & June \\ \hline
    Salt
             & 2
  \left( \frac{tabular}{} \right)
  \caption{Rabbit Breeding Chart}
\end{table}
```

| Rabbit Report |     |                |       |  |
|---------------|-----|----------------|-------|--|
|               |     | Breeding Dates |       |  |
| Name          | Age | Last           | Next  |  |
| Pepper        | 1   | Sept           | March |  |
| Princess      | 4   | Nov            | Dec   |  |
| Salt          | 2   | Oct            | June  |  |

 Table 1: Rabbit Breeding Chart

### Pictures

The picture environment is entered as follows:

 $x\_dimen$  and  $y\_dimen$  represent the width and height of the picture respectively. The offset parameters are optional. Dimensions are given in terms of the \unitlength which can be set using \setlength.

The following commands are the basic picture commands:

- $\langle put(x_coord, y_coord) \{ picture \ object \}$
- $\operatorname{(x_coord, y_coord)(x_incr, y_incr){num}}{picture object}$

The coordinate system is as follows:

- the X-direction is along the bottom.
- the Y-direction is along the side.
- the lower left-hand corner is (0, 0).
- the lower right-hand corner is  $(x_dimen, 0)$ .
- the upper left-hand corner is  $(0, y\_dimen)$ .

# Picture Objects

The following commands can be used to create picture objects:

- $(makebox(x_dimen, y_dimen)[pos]{text}$
- $\langle ramebox(x_dimen, y_dimen)[pos]{text}$
- $\operatorname{dashbox} \{ \operatorname{dash}_{\operatorname{dimen}} \} (x_{\operatorname{dimen}}, y_{\operatorname{dimen}}) [pos] \{ text \}$

Text is positioned in the box according to *pos*:

| pos                      | Positioning                                  |
|--------------------------|--|
| 1                        | horizontally flush against left edge of box  |
| r                        | horizontally flush against right edge of box |
| $\mathbf{t}$             | vertically flush against top edge of box     |
| b                        | vertically flush against bottom edge of box  |
| $\langle missing  angle$ | centered horizontally and vertically         |

Choose one or two of these to determine position.

You can choose thick or thin lines with:

- $\$  thinlines
- $\$  thicklines

### Lines, Vectors and Circles

The following commands are used to draw lines, vectors and circles:

- \line(h\_slope, v\_slope) { dimen }
- $\langle vector(h_slope, v_slope) \{ dimen \}$
- \circle{diameter}
- \circle\*{diameter}
- \oval(x\_dimen, y\_dimen) [part]

The parameters are as follows:

- Slopes  $(v\_slope \text{ and } h\_slope)$  are positive or negative numbers
- *dimen* is the horizontal extent of the line (or vector)
- *diameter* is self-explanatory
- 'circle' draws a circle up to one-half inch
- 'circle\*' draws a disk up to about .2 inch in diameter
- *part* in the oval command allows you to draw part of the oval
  - l for the left half
  - $-\mathbf{r}$  for the right half
  - $-\mathbf{t}$  for the top half
  - **b** for the bottom half
  - Combine to get quarters (e.g. 'tl' means top left quarter)

# Examples of Picture Objects



Figure 2: Some Picture Objects

# File types and locations

#### • File types

- style files (".sty" extension)
- style documentation files (".doc" extension)
- auxilary files (".aux" extension)
- table of contents files (".toc" extension)
- list of tables files (".lot" extension)
- list of figures files (".lof" extension)
- File locations
  - $\square T_E X$  uses the environment variable TEXINPUTS
  - TEXINPUTS is list of directories separated by colons
  - Standard directories
    - " . " (current directory)
    - $\circ$  /usr/local/lib/tex/inputs

Example:

```
setenv TEXINPUTS .:/usr/local/lib/tex/inputs:/user/sam/lib
```

- Directories searched in left-to-right order
- The ".sty" file
  - Used to define macros, initial parameters
  - Read in by the "**\usepackage**" command \*
  - ".sty" files typically have no comments to shorten the time needed to load the files
  - Files with a ".doc" extension are typically identical to their corresponding ".sty" files but have comments Example:
    - \* File loaded in by  $\[\]$  TEX (no comments): foo.sty
    - \* Documentation file (foo.sty+comments): foo.doc

<sup>\*</sup>Read in by '\documentstyle' in  $\[mathbb{MT}_{E}X 2.09\]$ 

### Macro definitions

- Macro names are composed of letters (both upper and lower case) and may **not** contain numbers or punctuation marks
- By default, macros parameters may **not** contain multiple paragraphs.
- Macros may have up to 9 parameters (named  $\#1, \#2, \ldots \#9$ )
- Macro defining commands from  ${\rm I\!A}T_{\rm E}\!X$ 
  - \newcommand {\name} [#-of-parameters] { replacement-text } Defines a macro; checks that macro is not already defined. An error message is printed if macro already exists.
  - \renewcommand {\name}/#-of-parameters/{replacement-text} Redefines a macro which already exists. If so, an error message is printed.

#### [#-of-parameters]

The number of parameters  $\ name may have$ ; this argument is optional and assumed to be 0 if not specified.

Examples:

 $\response \$ 

 $\renewcommand{\thesubsection}{\thesection-\alph{subsection}}$ 

### File Handling

- Including files (file name are listed without the ".tex" extension)
  - $\in \{ ONE file name \}$ 
    - \* Example: \input{chap1}
    - \* Example: \input chap1
  - \include{ ONE file name }
    - $\ast$  causes an "included-file-name.aux" to be created

    - \* Starts a new page (i.e. invokes \newpage)
  - \includeonly{ file names separted by commas }
    - \* Used in conjunction with  $\$ include.
    - \* Causes only thoses files listed to be included in the document (page numbering with regards to the entire document is typically preserved)
    - \* Included when not every "\include" command is to be executed.
    - \* Example: \includeonly{chap1,chap4,refs}

# Output-effecting Routines

#### 

- Shift into one column (two columns) per page format
- Begins a new page

#### 

- Begins a new page in one-column format
- Begins a new column in two-column format

#### • $\clearpage$

- Similar to  $\newpage$  but forces the output of any figures or tables not yet printed.
- Used by **\chapter** and **\include** to begin a new page

#### • \cleardoublepage

- Begins a new page
- Will produce a blank page, if necessary, to guarentee that the new page starts on an odd-number page.

#### • \samepage

- Prevents page breaks between:
  - 1. lines of the paragraph in which it is used
  - 2. before or after a displayed equation, before or after a displayed equation environment or section heading lying within its scope
  - 3. before an item in a list environment (i.e. itemize, enumerate, etc.) other than the first item

#### • \nopagebreak

- Discourages a pagebreak
- Can be ignored by TEX and LATEX; use  $\simetamed{samepage}$  to force no page breaks

### How to Use $IAT_EX$

- Create a DVI file from *filename*.tex
  - 1. create a file which is named *filename*.tex
  - 2. type latex filename
  - 3. fix errors and run again
  - 4. this generates, among other things, a *filename*.dvi file
- To print on the ti printer: dvips -f filename.dvi | lpr
- To create a postscript file: dvips -o filename.ps filename.dvi
- Usage of dvips is found by typing dvips at the command prompt
  - To print only certain pages of a document, add the option

-ppfirst\_page-last\_page

where *first\_page* and *last\_page* define a range of pages to print. For example:

dvips -pp 4-10 -f paper1.dvi | lpr

prints pages 4 through 10. If you only want a single page, list only the one page. (e.g. '-pp 4-4')

Note: dvips prints all pages whos arabic page number is in the range specified. If paper1 also had pages 'vi' through 'x' (i.e. roman-numeral numbered pages), they, too, would be printed.

- To preview on a SUN under '**OpenWindows**: xdvi filename
  - type *space* or **f** or **n** to see next page
  - type *delete* or **b** or **p** to see previous page
  - type *numberg* to go to page *number*
  - type u, d, l or r to move the page UP, DOWN, LEFT or RIGHT.
  - type R to re-read the DVI file
  - you can scroll the pages up and down using the scroll bars
  - type q/CTRL-D/CTRL-C to quit

#### References

- - [1] Knuth, Donald, *The T<sub>E</sub>Xbook*, Addison-Wesley Publishing Company, 1984.