Figures

• Figure number and descriptive captions go *under* figures

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Fig 1. A Simplified Jumping Model
Figures

- Figure number and descriptive captions go *under* figures
- Label parts according to function
Figures

• Figure number and descriptive captions go under figures
• Label parts according to function
• Provide enough dimensions to give scale
• Font size ≥ body-text size
• White backgrounds are best
• Generate caption in document prep. software, not the drawing software
• A secret (Don’t tell anyone): The better your figures are, the worse your writing can be
Good or Bad?

Figure 7: Alternate Design 1
Good or Bad?

• Mostly bad
  - No labels
  - No dimensions to give scale
  - Dark background
  - Non-descriptive caption

• Good
  - Figure #: Caption below figure
  - No crazy colors in figure

Figure 7: Alternate Design 1
The machine’s performance is evaluated on effectiveness of the design process, followed by suggestions of key improvements.
Good or Bad?

- Mostly Good
  - Most parts labeled according to their function
  - Enough dimensions given to provide scale
  - Light background
  - Descriptive caption

- Bad
  - Crazy colors
  - Some part labels too generic

Figure 1: Blofield’s Bug Launcher
Good or Bad?

The house of quality presented in Figure 4 shows the customer requirements and their relationship with the engineering characteristics. The most important customer requirements include autonomous operation and defeating the henchmen. Autonomous operation is important because no human interaction is allowed during the competition, so all actions must be accomplished automatically. Defeating the henchmen is also important because it is the easiest of the goals to accomplish to affect the score, so it is wise to take advantage of those points. The most important engineering characteristics are program timing and mobility. Program timing is by far the most important characteristic because it is what makes the robot move autonomously and efficiently, which is essential to the competition. Mobility is also vital because if the robot can’t move properly then no goals will be accomplished.

Figure 1: Pac-man Front View

Figure 2: Pac-man Top View

Figure 3: Pac-man Side View
Generating Figures

• Use a **vector graphics** format, will scale up/down without degrading quality

• Avoid using screenshots, use a proper export (to a vector graphics format) from the graphics program

• Check quality once they are inserted into your document/presentation
  - Is the text at least as large as the document body text?
  - Is the figure/plot clear, without any compression artifacts?
Figure Generation Software

• Inkscape – https://inkscape.org/
  - open-source and free
  - available on macOS, Windows, and Linux

• Commercial Options
  - Adobe Illustrator (macOS and Windows)
  - Sketch (macOS)
  - Autodesk Graphic (macOS and iOS)
Plots

• Figure number and descriptive captions go under figures

• Include units

• Differentiate between lines (also clear in B/W) and provide a legend

• Don’t cover data with the legend

• Font size $\geq$ body-text size

• White backgrounds are best
Figure 1: Vibration
Good or Bad?

- Text is too small
- Lines are too thin
- Unable to distinguish lines in B/W
- No legend
- No units
- Figure caption not descriptive enough
Figure 1: Amplitude of Vibration as a Function of Frequency

\[ \frac{|x|}{e^{\beta}} \]

Normalized Frequency

- $\zeta = 0.0$
- $\zeta = 0.1$
- $\zeta = 0.2$
- $\zeta = 0.4$
Writing about Figures/plots

• Include and number figures in order of reference in the text

• Don’t include figures you don’t reference in the text

• Exactly match terms from figure in text

• Referencing in text:
  - “Figure X shows... ”
  - “..., as shown in Figure X.”
  - “Figure X is ...”
  - Do not use parenthetical citation, “blah blah (Figure X).”
• “Figure 1 shows a front view of the Pac-man device. It is built atop a wood base and uses two plastic rolling tires…”

• “A top view of the Pac-man device is shown in Figure 2. The two Henchmen and One-liner aluminum arms are shown expanded in this view…”
Tables

- Font size \( \geq \) body-text size
- Table number and caption go *above* the table
- Number and include in order of reference in text
- Reference similar to figures – “The command and control methods to be explored are shown in Table 1…”
- Do *not* use a screenshot of an Excel worksheet

<table>
<thead>
<tr>
<th>Command Generation Method</th>
<th>Control Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Input Shaping</td>
<td>PID</td>
</tr>
<tr>
<td>Unity Magnitude (UM) Shaping</td>
<td>( H_\infty )</td>
</tr>
<tr>
<td>Specified Negative Amplitude (SNA) Shaping</td>
<td>Sliding Mode</td>
</tr>
<tr>
<td>Deflection-Limited Input Shaping</td>
<td>Model Reference</td>
</tr>
</tbody>
</table>

Table 1: Command and Control Methods to Be Explored
Proper Citation

• If you did not generate a figure or plot yourself, you must cite its source.

Figure 1: Watching the Sun Set Behind Mt. Fuji [1]
Where to Include the Figures/Tables?

• Inline with text
  - At top or bottom of the column in which they appear
  - As close to reference in text as possible

• All at the end of the report
  - Attached and numbered in order of reference in the text
  - No need for a section title

• Do *not* mix the two styles
Thank you.