Smoothed Particle Hydrodynamics and Discrete Element Method Coupling

A Dissertation
Submitted in partial fulfillment of
the requirements for the degree of
Doctor of Philosophy
by

Dinesh A
(Roll No. 153010009)

Department of Aerospace Engineering
Indian Institute of Technology Bombay
Mumbai 400076 (India)

31 January 2018

*Dedicated to *Bale**

Acceptance Certificate

Department of Aerospace Engineering

Indian Institute of Technology, Bombay

The dissertation entitled "Smoothed Particle Hydrodynamics and Discrete Element Method Coupling" submitted by Dinesh A (Roll No. 153010009) may be accepted for being evaluated.

Date: 31 January 2018

Table of Contents

List of Figures

List of Tables

Chapter 1

Report writing using org-ref

1.1 Citing a paper

In order to cite a paper, first one needs to save all the **bibtex** entries in a file, say **references.bib**. To have access in all the devises one can store that file in **dropbox** or **drive**.

Then we can make org-ref to see this by writing the following line in **.emacs** file or **init.el** file.

```
(setq reftex-default-bibliography '("~/Dropbox/Research/references.bib"))
```

Detail code is available at `https://github.com/dineshadepu/code/blob/snapshot/common/emacs_setup/init.el`.

After setting up the background for references one needs to type **C-c]**. Which brings up all the references in the provided **reference.bib** file.

Searching for a keyword will bring up the requisite paper(s), which can be selected and cited.

Hoover *et al.* (1994)

At the bottom of the file specify the bibliography style, and bibiliography file name.

```
bibliography:./references.bib
bibliographystyle:./authyr.bst
```

1.1.1 Note

1. For the following example, I used a reference bibtex file, placed locally at the folder, rather than placing it in the dropbox or some sync folder. The bibliography style used here is not **plain**, it is a specified style as in **authyr** file.

2. If you want to use your own style, place such specific **<some>.bst** file in the root folder, and name it in the file.

1.2 Selecting more papers

Suppose we want to cite more papers at a single point, one has to select all the references using control-space i.e., **C-spc**, and navigating through the rows and selecting all the references, finally press **enter**.

Hoover *et al.* (1994); Hernquist (1993); Hernquist and Katz (1989); Petschek and Libersky (1993)

1.3 Changing a cite type.

Suppose I want to change the cite type, till now we saw **cite:<some reference>**, now we want something like Hoover *et al.* i.e., citing with author name. which in general is **Hoover *et al.***. This can be done by clicking **C-u ENTER**, then we get many types of cites, and we can choose any one of them.

Chapter 2

Labelling chapters, equations, figures etc..

2.1 Label a chapter, section, subsection

In order to label a chapter we can use the function

`org-ref-helm-insert-label-link`

$$E = mc^2 \tag{2.1}$$

2.1 By invoking mini buffer using **M-x**, and typing the function. To avoid frequent typing of such function, we can use leader key to bind to a specific key.

- To cite a section or figure or a table, first give it a label. Here I am plotting a *sin* curve using python.

  ??

2.2 Label figure and equation

To label a equation, we can use the org mode equation formal, in the second line we can add the label link as following.

```
\begin{equation}
  \label{equation:pcisph}%
  E = mc^{2}
\end{equation}
```

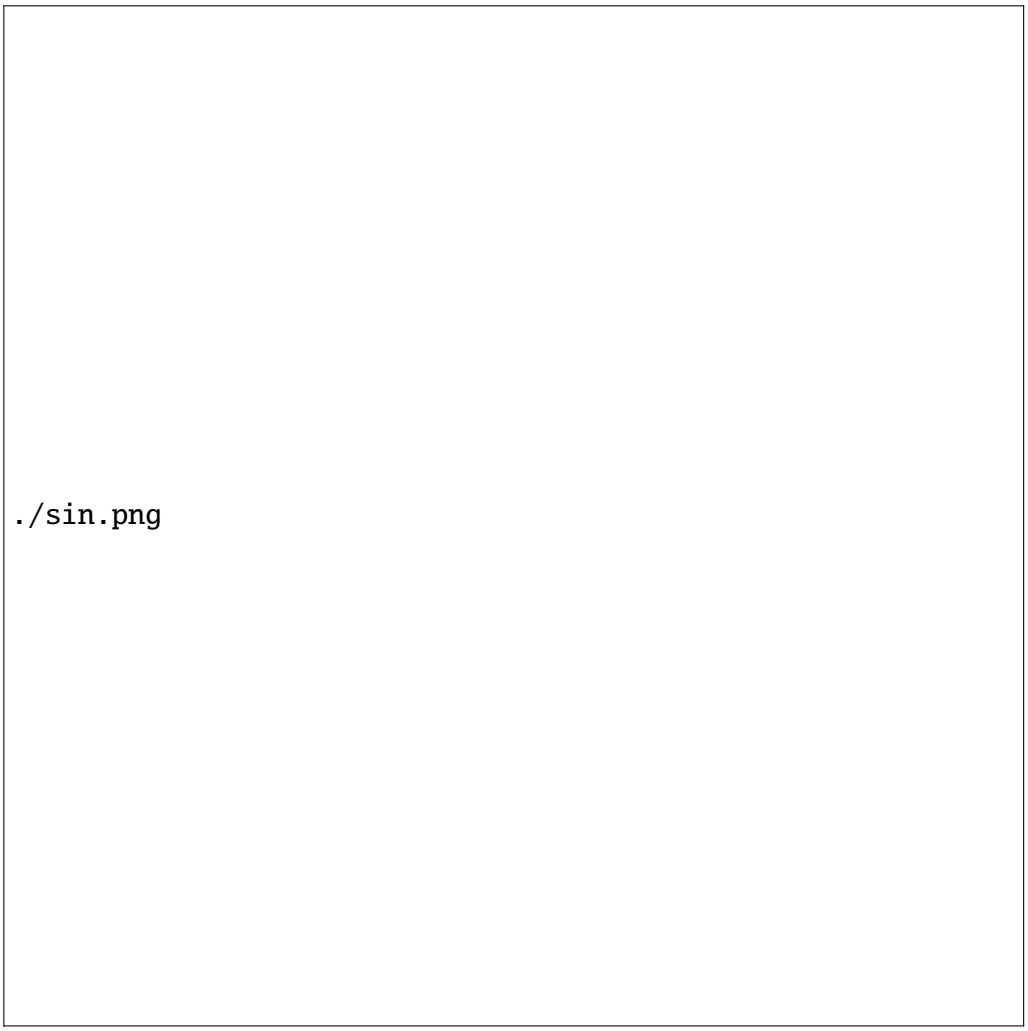

Figure 2.1: sin vs x in python

But figure is labelled in a different way. Either we can use latex to insert a figure and label it inside its source blocks or explicitly use org functionality.

```
#+CAPTION: this is a figure label:fig:figure
#+ATTR_LaTeX: scale=0.75
```

- Always try to use $label:fig:some$ in small caps, functionality. Which will simply inserts labels in the document, which helps us to cite the line number page number and everything.

Chapter 3

Referring a label

C-u C-c] 3

References

Hernquist, L., 1993, "Some cautionary remarks about smoothed particle hydrodynamics," *The Astrophysical Journal* **404**, 717.

Hernquist, L., and Katz, N., 1989, "Treesph - a unification of sph with the hierarchical tree method," *The Astrophysical Journal Supplement Series* **70**, 419.

Hoover, W., Pierce, T., Hoover, C., Shugart, J., Stein, C., and Edwards, A., 1994, "Molecular dynamics, smoothed-particle applied mechanics, and irreversibility," *Computers & Mathematics with Applications* **28**, 155–174.

Petschek, A., and Libersky, L., 1993, "Cylindrical smoothed particle hydrodynamics," *Journal of Computational Physics* **109**, 76–83.