

Documentation for the use of the *tikzcivil* package

Cristóbal Tapia
`crtapia@gmail.com`

July 1, 2014

Contents

0.1	Introduction	2
1	Drawing for the Structural Analysis	3
1.1	Commands	3
1.1.1	\axisTwo	3
1.1.2	\axisTwoRot	3
1.1.3	\Support	4
1.1.4	\MassWithSpring	4
1.1.5	\Frame	5
1.1.6	\FrameSimple	6
2	Drawings for the Geomechanics	7
2.1	Commands	7
2.1.1	\RetainingWall	7
2.1.2	\GravityWall	7
3	Timber structures	9
3.1	Commands	9
3.1.1	\TimberBeam	9

• • •

0.1 Introduction

Chapter 1

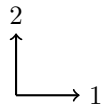
Drawing for the Structural Analysis

The following commands are designed to be used in the description of typical civil engineering problems. Each command will have a brief description of its use and one or two examples. The commands also accept different options, that affect a variety of properties in each drawing. This options are also presented in a table positioned in the same section as the description of the command.

...

1.1 Commands

1.1.1 `\axisTwo` This commands allows to draw a two-dimensional axis, where the name of each of the perpendicular directions must be given by the user. It is useful when one needs to specify the degrees of freedom of a system or part of a system, when there is no rotation involved.



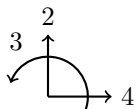
```
\begin{tikzpicture}
  \axisTwo[]{1}{2}
\end{tikzpicture}
```

Figure 1.1: 2D axis.

Table 1.1: Options for the `\axisTwo` command

Option	Description	default
<code>size</code>	defines the size of the axis (length of one arrow)	30pt
<code>position</code>	(tuple) defines the position of the support	{0,0}
<code>rotate</code>	rotation in degrees (counterclockwise)	0

1.1.2 `\axisTwoRot` This commands allows to draw a two-dimensional axis, where the name of each of the perpendicular directions must be given by the user. It is useful when one needs to specify the degrees of freedom (dof) of a system or part of a system, when a rotational dof is involved.



```
\begin{tikzpicture}
  \axisTwoRot[]{1}{2}{3}
\end{tikzpicture}
```

Figure 1.2: 2D axis with rotation dof.

Table 1.2: Options for the `\axisTwoRot` command

Option	Description	default
<code>size</code>	defines the size of the axis (length of one arrow)	30pt
<code>position</code>	(tuple) defines the position of the support	{0,0}
<code>rotate</code>	rotation in degrees (counterclockwise)	0

1.1.3 \Support This command is used to generate different types of supports, like fixed, pinned or sliding supports. They can also be rotated.

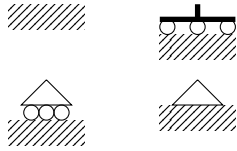


Figure 1.3: Types of supports available.

```
\begin{tikzpicture}[scale=1.0]
  \Support[width = 1cm, type=fixed]
  \Support[position={2cm,0cm}, angle=0,
    width = 1cm, type=fixedsliding]
  \Support[position={0cm,-2cm}, angle=0,
    width = 1cm, type=sliding]
  \Support[position={2cm,-2cm}, angle=0,
    width = 1cm, type=pinned]
\end{tikzpicture}
```

Table 1.3: Options for the \Support command

Option	Description	default
width	defines the width of the support	1cm
position	(tuple) defines the position of the support	{0,0}
type	defines the type of support. Alternatives: fixed , pinned , sliding , fixedsliding	fixed
angle	rotation in degrees of the support (counterclockwise)	0

1.1.4 \MassWithSpring This command draws a typical mass-spring system. It supports also an optional damper and displacement. The basic behavior of this command is shown in fig. 1.4.

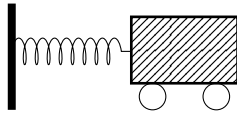


Figure 1.4: Mass-Spring system

```
\begin{tikzpicture}[scale=1]
  \MassWithSpring[]
\end{tikzpicture}
```

Table 1.4: Options for the \MassWithSpring command

Option	Description	default
position	(tuple) defines the position of the support	{0,0}
displacement	defines the displacement of the mass. Positive as well as negative values are accepted.	0
with damper	boolean variable. Defines if the system should have a damper.	false
with wall	boolean variable. Specifies if the wall should be drawn.	true

In many situations we would like to describe more interesting systems. This can be achieved applying the optional key values and using the command multiple times, as shown in fig 1.5. As it can be seen, creating this kind of drawings is very easy and straightforward.

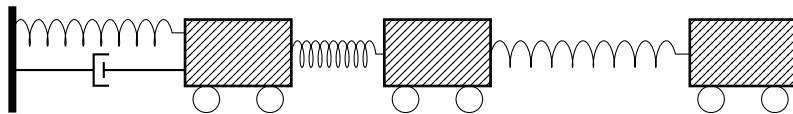
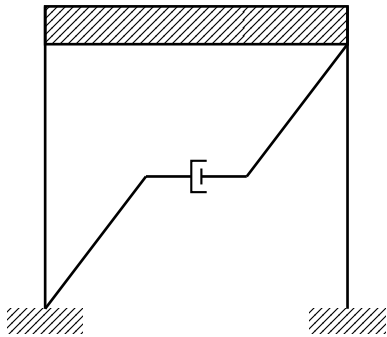


Figure 1.5: More complex mass-spring system

```
\begin{tikzpicture}[scale=1]
  \MassWithSpring[displacement = 2em, with damper]
  \MassWithSpring[displacement = -1em, with wall = false, position = {10.5em,0em}]
  \MassWithSpring[displacement = 3em, with wall = false, position = {18.0em,0em}]
\end{tikzpicture}
```

1.1.5 \Frame This command draws a frame with its mass concentrated above. It is a very common model to describe later a multi-story building in 2D. This command has many options, useful to change the displacement, position, use of supports, damper, among others. In the fig. 1.6 can be seen the normal output of the command without any options.



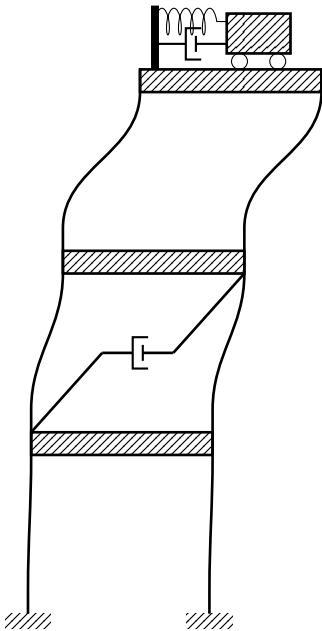
```
\begin{tikzpicture}[scale=1]
  \Frame[with damper=true]
\end{tikzpicture}
```

Figure 1.6: A frame with the mass concentrated at the top.

Table 1.5: Options for the `\Frame` command

Option	Description	default
<code>height</code>	defines the height of the frame/story	4cm
<code>width</code>	defines the width of the frame	4cm
<code>mass thickness</code>	defines the thickness of the concentrated mass	0.4cm
<code>position</code>	(tuple) defines the position of the base of the left column	{0,0}
<code>with support</code>	boolean option, that allows to show supports or not	true
<code>with damper</code>	boolean option, that defines the presence of a damper in the system	false
<code>displacement</code>	defines the amount of horizontal displacement on the top of the frame	0cm

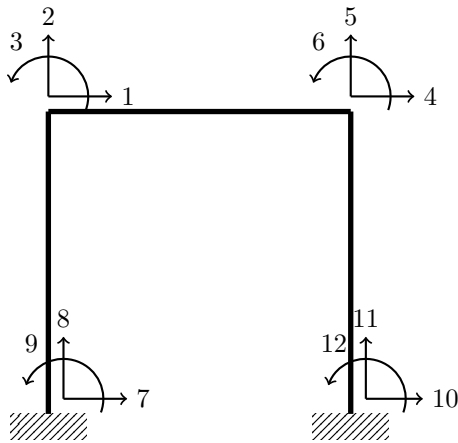
As with the `\MassWithSpring` command, we can create more complex structures, and even add some displacement to it or add a tuned mass damper on the top (why not?). This can be seen on fig. 1.7.



```
\begin{tikzpicture}[scale=0.7]
  \Frame[position = {0em,0em}, displacement=0.07cm]
  \Frame[position = {0.07cm,4cm}, with support=false, displacement=0.7cm]
  \Frame[position = {0.77cm,8cm}, with support=false, displacement=1.7cm]
  \MassWithSpring[position={2.8cm,12cm}, with damper=true]
\end{tikzpicture}
```

Figure 1.7: A set of frames put one above the other.

1.1.6 \FrameSimple The `\Frame` command is best suited for dynamic systems, so when we want to draw a frame for other purposes, we should use this command. It creates a nice frame with bars, whose support's type can be changed. It also allows to vary its dimensions (width and height) and makes possible to move each degree of freedom separately.



```
\begin{tikzpicture}[scale=1]
\FrameSimple[]
\axisTwoRot[position={0.0cm,4.2cm}]{1}{2}{3}
\axisTwoRot[position={4.0cm,4.2cm}]{4}{5}{6}
\axisTwoRot[position={0.0cm,0.2cm}]{7}{8}{9}
\axisTwoRot[position={4.0cm,0.2cm}]{9}{11}{12}
\end{tikzpicture}
```

Figure 1.8: A simple frame.

Table 1.6: Options for the `\FrameSimple` command

Option	Description	default
<code>width</code>	defines the width of the frame	4cm
<code>height</code>	defines the height of the frame	4cm
<code>position</code>	(tuple) defines the position of the support	{0,0}
<code>left support</code>	left support type (see 1.1.3 for more details.)	fixed
<code>right support</code>	right support type (see 1.1.3 for more details.)	fixed
<code>dofX</code>	moves/rotate degree of freedom "X".	0

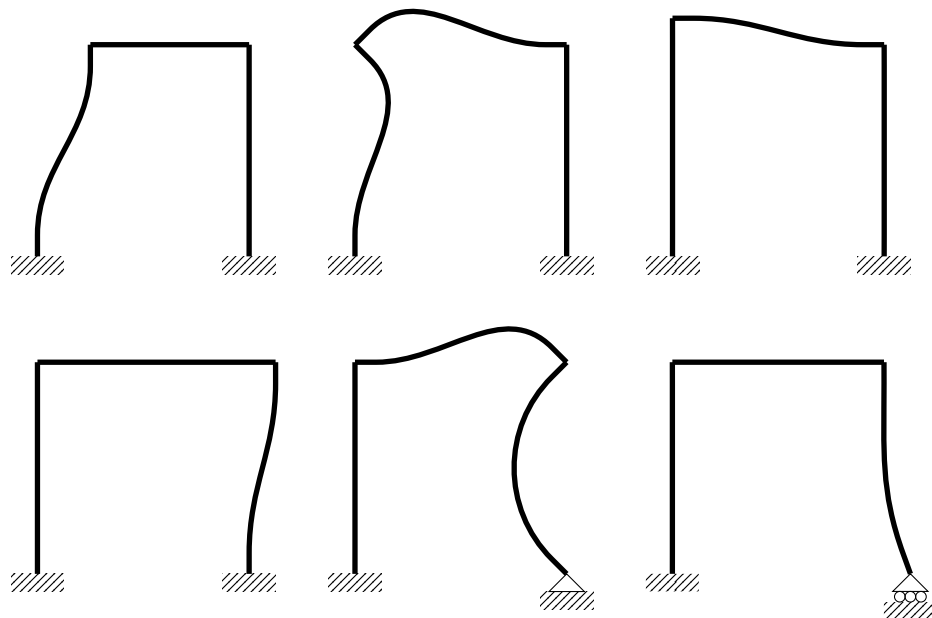


Figure 1.9: Moving different DOF's

Chapter 2

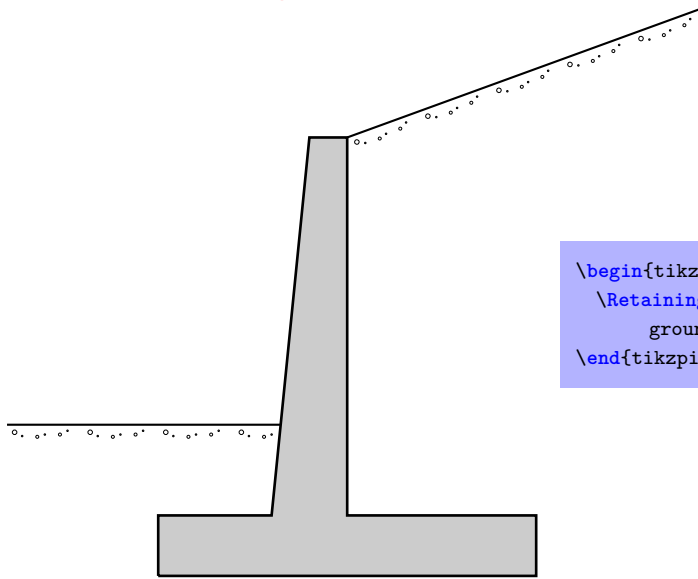
Drawings for the Geomechanics

This chapter presents the commands dedicated to facilitate the creation of drawings for the geomechanics. Like in the previous chapter, every command will be presented with an example and with the description of the options that can be passed to the command.

...

2.1 Commands

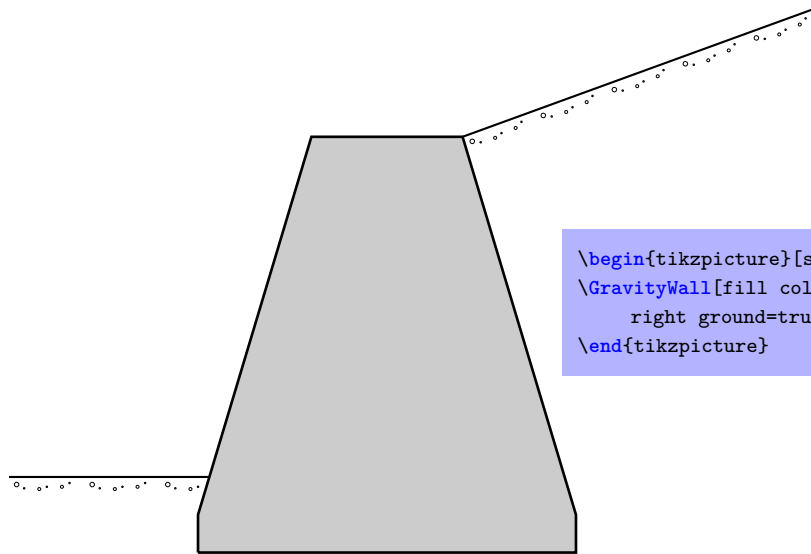
2.1.1 `\RetainingWall` Description.



```
\begin{tikzpicture}[scale=1]
  \RetainingWall[fill color=black!20, left ground=true, right
    ground=true]
\end{tikzpicture}
```

Figure 2.1: Retaining Wall

2.1.2 `\GravityWall` Description.



```
\begin{tikzpicture}[scale=1]
\GravityWall[fill color=black!20, beta=20, left ground=true,
right ground=true, left ground height=1cm]
\end{tikzpicture}
```

Figure 2.2: Gravity Wall

Chapter 3

Timber structures

...

3.1 Commands

3.1.1 `\TimberBeam` Test test tes

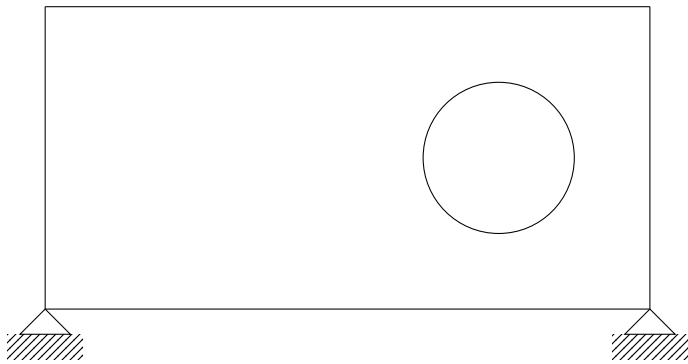


Figure 3.1: Timber Beam

```
\begin{tikzpicture}[scale=1]
  \TimberBeam[]
\end{tikzpicture}
```