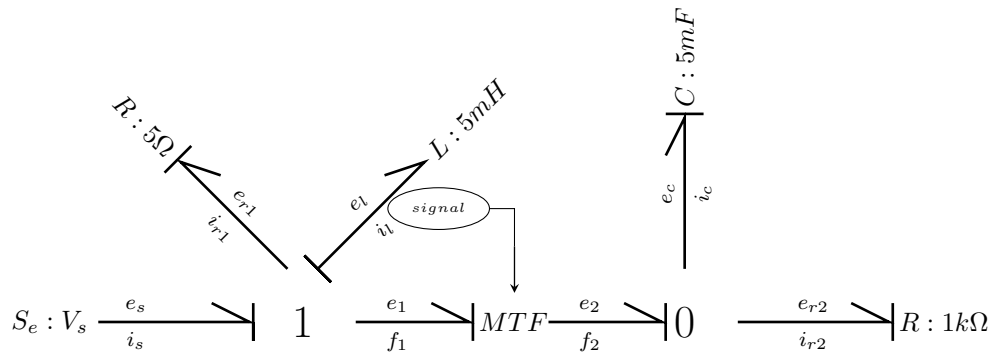


Bond Graph elements

with TikZ*



1 DC motor model

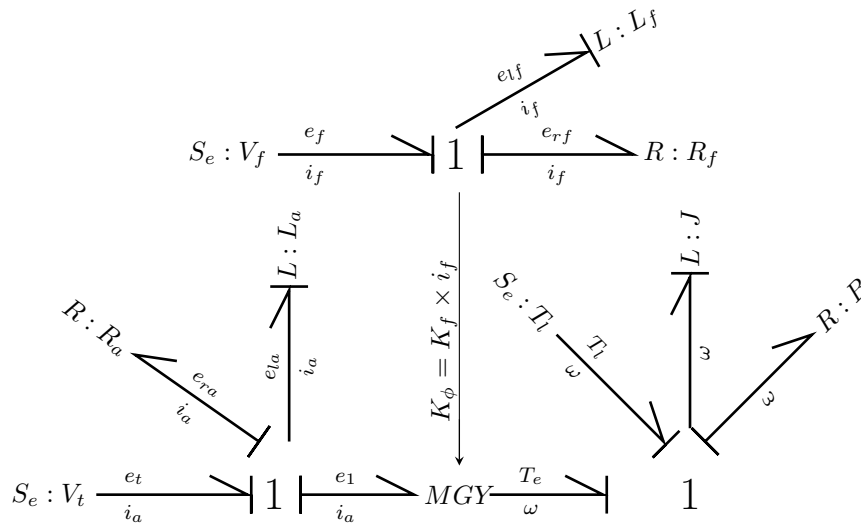


Figure 1: Bond graph model of a DC motor

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2 Bond Graph elements

The bond graph elements are divided into the following categories.

1. One port element.
2. Two port elements.
3. Sources.
4. Junctions.

2.1 Junction elements

The macros for the two junction is `\bgJn [] { } { } []`.

2.1.1 Parameters

1. [optional] Distance from the referenced node.
2. {required} Referenced element name.
3. {required} New element name.
4. [optional] Type of junction.

2.2 One port elements

Four macros for the one port elements are available.

1. Effort causal in forward direction \rightarrow `\bgRex [] { } { } { } { } { } [] []`
2. Flow causal in forward direction \rightarrow `\bgRfx [] { } { } { } { } { } [] []`
3. Effort causal in reverse direction \rightarrow `\bgRexr [] { } { } { } { } { } [] []`
4. Flow causal in reverse direction \rightarrow `\bgRfxr [] { } { } { } { } { } [] []`

2.2.1 Parameters

1. [optional] Rotation in degree.
2. {required} Referenced element name.
3. {required} New element name.
4. {required} Element type.
5. {required} Element label in figure.
6. {required} Effort variable label.
7. {required} Flow variable label.

8. [optional] Element position w.r.t referenced element.
9. [optional] Distance from the referenced node.

2.3 Two port elements

There are eight macros in all for the two port elements.

1. Two macros for transformer (effort and flow) \rightarrow `\bgTex[]{}{}{}{}{}{}{}[]` and its cousin `\bgTfx`
2. Similar set of macros for gyrator (effort and flow) \rightarrow `\bgGex[]` and `\bgGfx`
3. For modulated transformer (effort and flow) \rightarrow `\bgMTex[]` and `\bgMTfx`
4. And for modulated gyrator (effort and flow) \rightarrow `\bgMGex[]` and `\bgMGfx`

2.3.1 Parameters

For TF and GY elements the parameters are.

1. [optional] Rotation in degree.
2. {required} Referenced element name.
3. {required} New element name.
4. {required} Modulation value.
5. {required} Port 1 effort variable label.
6. {required} Port 1 flow variable label.
7. {required} Port 2 effort variable label.
8. {required} Port 2 flow variable label.
9. [optional] Distance from the referenced node.

As the modulation for MTF and MGY is an external signal, there is a parameter less for these elements.

1. [optional] Rotation in degree.
2. {required} Referenced element name.
3. {required} New element name.
4. {required} Port 1 effort variable label.
5. {required} Port 1 flow variable label.
6. {required} Port 2 effort variable label.
7. {required} Port 2 flow variable label.
8. [optional] Distance from the referenced node.

2.4 Sources

Two separate macros are available for the two sources.

- Effort source $\rightarrow \backslash\text{bgEx}[\text{rotation}][\text{element}][\text{new_element}][\text{label}][\text{effort_label}][\text{flow_label}][\text{position}][\text{distance}]$
- Flow source $\rightarrow \backslash\text{bgEx}[\text{rotation}][\text{element}][\text{new_element}][\text{label}][\text{effort_label}][\text{flow_label}][\text{position}][\text{distance}]$

2.4.1 Parameters

1. [optional] Rotation in degree.
2. {required} Referenced element name.
3. {required} New element name.
4. {required} Element label in figure.
5. {required} Effort variable label.
6. {required} Flow variable label.
7. [optional] Element position w.r.t referenced element.
8. [optional] Distance from the referenced node.