Interaction between a magnetized needle and the Earth's magnetic field

Presentation

Program	Dimension	Physics	Application	Work area
Flux	2D	Magnetic	Transient	Rotating actuators

General remarks

Study of the interaction between a magnetized needle and the Earth's magnetic field.

This example represents a first step in rotating machines modelling.

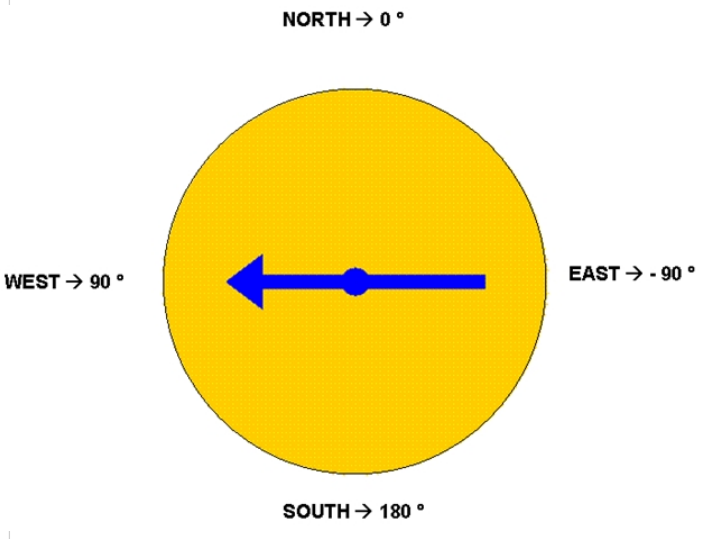
Objective

Computation of the needle's position against the Earth's North (= magnetic south).

The parameter the user can change is:

Needle initial position (POS_INIT)

Properties

Illustration	Main characteristics
	• Earth's magnetic field = 50µT • The compass needle is considered as a magnet with: Relative permeability: µr = 100 Remanent induction : Br = 0.1T • Compass initial position: POS_INIT = 90 ° • Needle's moment of inertia = $1E^{-7}$ kg.m² • Viscous friction coefficient = $0.45E^{-7}$ N.m.s/ radian

Results

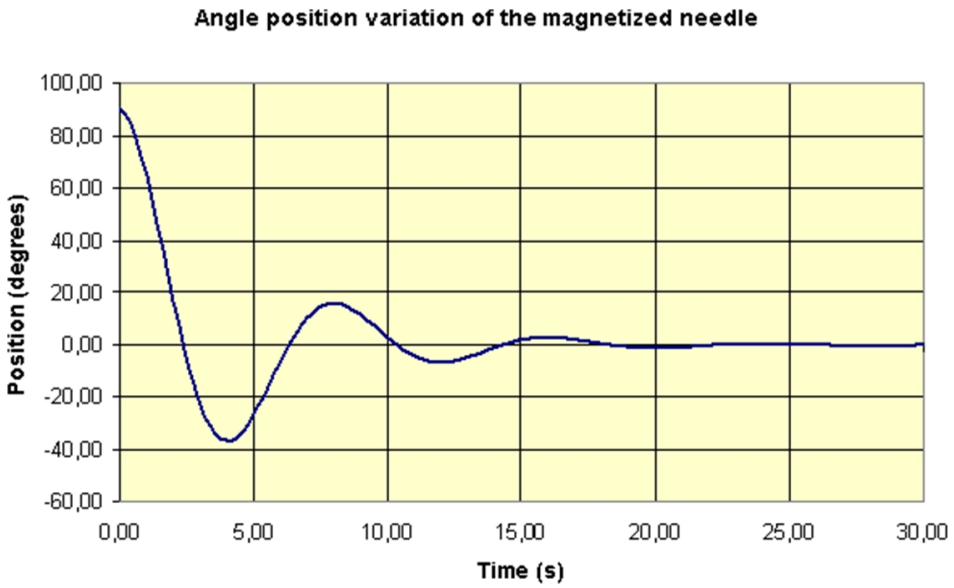


Figure 1: Evolution of the needle's angle position according to time

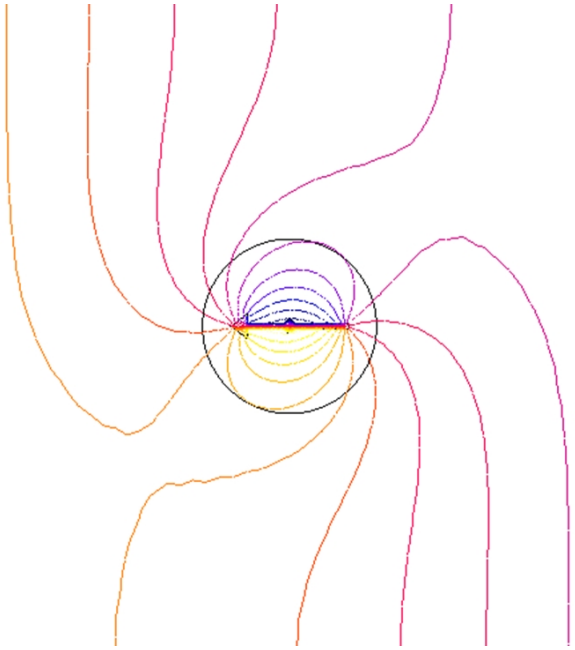


Figure 2: Position of the needle = 90 °

To go further:

- Position of a compass subjected to a magnetic field created by a conductor
- Consider multiple compass in the same example etc.