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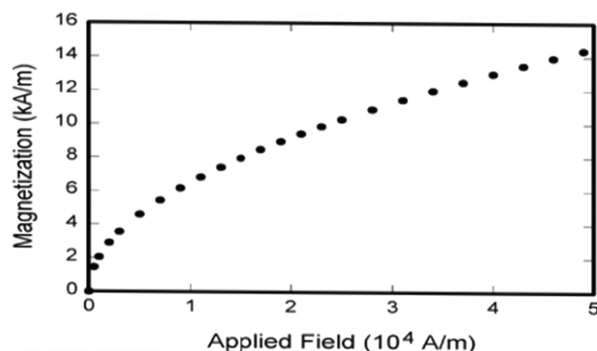
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**TABLE 1.** Units for magnetic properties.

Symbol	Quantity	Conversion from Gaussian and CGS EMU to SI <sup>a</sup>
$\Phi$	Magnetic flux	1 Mx $\rightarrow 10^{-8}$ Wb $= 10^{-8}$ V $\cdot$ s
$B$	Magnetic flux density, magnetic induction	1 G $\rightarrow 10^{-4}$ T $= 10^{-4}$ Wb/m <sup>2</sup>
$H$	Magnetic field strength	1 Oe $\rightarrow 10^{-3}/(4\pi)$ A/m
$m$	Magnetic moment	1 erg/G = 1 emu $\rightarrow 10^{-3}$ A $\cdot$ m <sup>2</sup> = $10^{-3}$ J/T
$M$	Magnetization	1 erg/(G $\cdot$ cm <sup>3</sup> ) = 1 emu/cm <sup>3</sup> $\rightarrow 10^{-3}$ A/m
$4\pi M$	Magnetization	1 G $\rightarrow 10^{-3}/(4\pi)$ A/m

<sup>a</sup>Gaussian units are the same as cg emu for magnetostatics; Mx = maxwell, G = gauss, Oe = oersted; Wb = weber, V = volt, s = second, T = tesla, m = meter, A = ampere, J = joule, kg = kilogram, H = henry.

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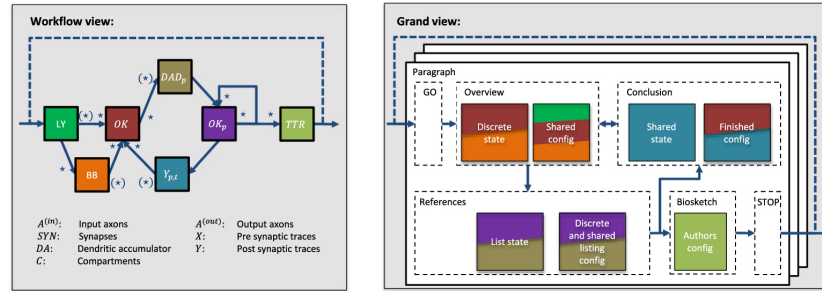
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## CONCLUSION

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## ACKNOWLEDGMENTS

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## REFERENCES

1. G. M. Amdahl, G. A. Blaauw, and F. P. Brooks, “Architecture of the IBM System/360,” *IBM J. Res. Dev.*, vol. 8, no. 2, pp. 87–101, 1964. (journal)
2. IBM Corporation, IBM Knowledge Center - IBM Secure Service Container (Secure Service Container). [Online]. Available: [https://www.ibm.com/support/knowledgecenter/en/HW11R/com.ibm.hwmca.kc\\_se.doc/introductiontotheconsole/wr2131zaci.html](https://www.ibm.com/support/knowledgecenter/en/HW11R/com.ibm.hwmca.kc_se.doc/introductiontotheconsole/wr2131zaci.html) (URL)
3. J. Williams, “Narrow-band analyzer,” PhD dissertation, Dept. Elect. Eng., Harvard Univ., Cambridge, MA, USA, 1993. (Thesis or dissertation)
4. J. M. Pérez, R. Berlanga, M. J. Aramburu, and T. B. Pedersen, “Integrating data warehouses with web data: A survey,” *IEEE Trans. Knowl. Data Eng.*, early access, Dec. 21, 2007, doi:10.1109/TKDE.2007.190746. (preprint)
5. W.-K. Chen, *Linear Networks and Systems*. Belmont, CA, USA: Wadsworth, 1993, pp. 123–135. (Book)
6. S. P. Bingulac, “On the compatibility of adaptive controllers,” in *Proc. 4th Ann. Allerton Conf. Circuits Syst. Theory*, 1994, pp. 8–16. (Conference proceedings)
7. K. Elissa, “An overview of decision theory,” unpublished. (Unpublished manuscript)

8. R. Nicole, "The last word on decision theory," *J. Comput. Vis.*, submitted for publication. (Pending publication)
9. C. J. Smith and J. S. Smith, Rocky Mountain Research Laboratories, Boulder, CO, USA, private communication, 1992. (Private communication)

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