Electronic Proceedings of Undergraduate Mathematics Day
4 2010 No. **4**, 1–11; **http://academic.udayton.edu/EPUMD/**

THE MARSHALL DIFFERENTIAL ANALYZER: A VISUAL INTERPRETATION OF MATHEMATICS

Bonita A. Lawrence, Richard P. Merritt and Devon A. Tivener

Marshall University
Department of Mathematics
Huntington, WV 25702 USA
e-mail: lawrence@marshall.edu,
merritt37@marshall.edu, tivener1@marshall.edu

Abstract

Mechanical integration is an idea dating back to the late 1800's discovered by James Thomson, brother of Lord Kelvin. This idea was then expanded to build a calculating machine, called a differential analyzer, by Vannevar Bush (M.I.T) in 1929. The Marshall University Differential Analyzer Team has followed in the footsteps of Dr. Bush and a gentleman named Dr. Arthur Porter, who was the first to build a differential analyzer in England when he was a student of Dr. Douglas Hartree. He built his machine of Meccano components, the British version of Erector Set. In the early days of Arthur Porter's research, the machine was used to solve ordinary differential equations and the results were compared to those of more sophisticated differential analyzers of that time. Dr. Porter's research proved that the Meccano differential analyzer was well suited for many dynamical systems applications. The Team has recently constructed the only two publicly accessible differential analyzers in the USA, a mini two integrator machine and a larger four integrator machine built in the spirit of the Porter Meccano Manchester Differential Analyzer. They are continuing in the spirit of Dr. Porter's work. In this work we will give a brief overview of the Marshall Differential Analyzer Project, the mechanics of the machine and the mathematics that can be described by the mechanics. An example will be presented to unify the mechanics and the mathematical concepts.