

Design of Magnetic Observatory Terminal (MO Terminal)

Mohd Khair Othman (dkhair@tm.net.my) and Prof. Ir. Dr. Ahmad Faizal Mohd. Zain (drfaizal@kuittho.edu.my)

Kolej Universiti Teknologi Tun Hussein Onn

Abstract

This poster describes the design of a Magnetic Observatory Terminal (MO Terminal). It is considered as the first attempt to set up an observatory in Malaysia about 5° south of the magnetic equator. With any new project to develop a magnetic observatory, the remote terminal is an essential step towards setting up the observatory. The MO Terminal constitute a well-defined structured software, with graphical tools, control and data processing to provide a unique component-base approach to real-time data acquisition. Its architecture is distributed with real-time features, ease of maintenance, and inexpensive system. The terminal is used in conjunction with the GEM Systems Proton Overhauser Magnetometer.

Motivation

1. Uneven distribution of geomagnetic Observatory to generation of global and regional model as International Geomagnetic Reference Field (IGRF). (Macmillan, S and Quinn J. M., 2000)
2. Lack of permanent continuously recording geomagnetic station in Malaysia present major problem for geophysical survey and special projects to focused on monitoring geomagnetic changes.
3. Magnetic Observatory is complement to ionospheric monitoring station where currently operated at main campus.

Introduction

- Initial program towards developing Magnetic Observatory in Malaysia was undertaken in year 1999 at National University of Malaysia (Zain & Abdullah).
- Concrete affected of developing Magnetic Observatory was undertaken in year 2002 at KUiTTHO.
- A key component of this is involved of student in context of cooperation with government agencies.
- At KUiTTHO, research activities were carried out with involved of operating instrument, developing software, hardware interfacing, perform magnetic survey and set-up a temporary observatory.

Magnetic Instrumentation

- Magnetometers are to measure magnetic flux density (nT).
- The GSM-19 is a Portable Vector Proton Overhauser effect instrument supplied by GEMs from Canada.
- The features of this instrument include:



- Microprocessor with storage capability
- Real-time/post data transfer
- Serial interface RS232
- Transfer Speed 19200 to 115200 baud.

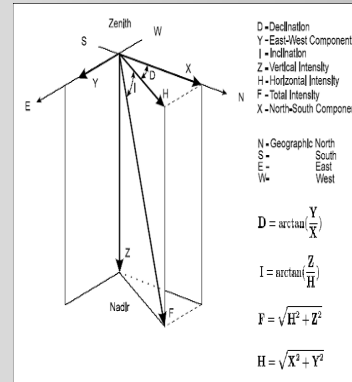
Magnetic Observatory

“Magnetic Observatory is where vector observation of the earth’s magnetic field are recorded accurately and continuously with a time resolution of one minutes or less over a long period of time.... the site of observatory must be magnetically clean and remain so for the foreseeable future.”

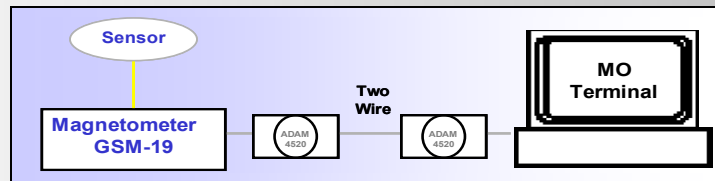
Data Acquisition System

Data Acquisition System can be described as ‘the collection of analogue/digital information for the purpose of observing and analysing real-time events, the ability of a system to determine critical levels of such events and to respond appropriately by outputting an analogue/digital signal which can control a devices.

The Earth’s Magnetic Field Components



Schematic Diagram Data Acquisition System



Future Plans

This software will be upgraded to cater standard requirement of magnetic observatory.

- Additional input from fluxgate
- Additional input from GPS.
- Additional input from temperature sensor.
- Calculate Kp Index.
- Digital Output format followed INTERMAGNET Standard.
- Data transfer using dial-up mode.

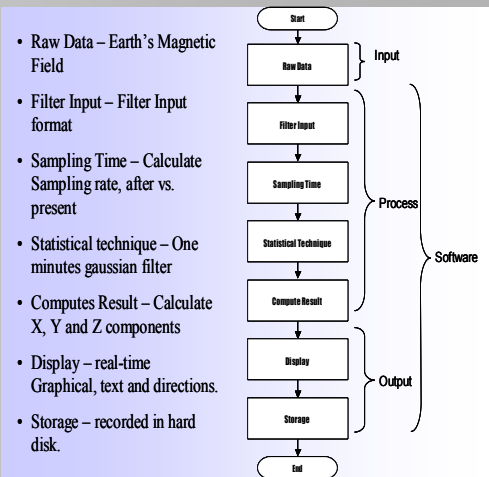
Conclusions

- Developed of new application software special for Magnetic Observatory is part of the University’s program to develop and enrich knowledge and also a vital step towards developing a magnetic observatory.
- MO Terminal was developed to be used as a tools when dealing for handling large quantity of data in a real-time.
- First concrete affected to develop Magnetic Observatory in Malaysia.

Data Logger Software

- MO Terminal is an application software to link between user and the data acquisition system.
- Permits reading the desired measurement from the driver and scaling, displaying, storing and analysis information.
- Programmable software is a icon-based program that represent real-world of application.

Flowchart



- Raw Data – Earth’s Magnetic Field
- Filter Input – Filter Input format
- Sampling Time – Calculate Sampling rate, after vs. present
- Statistical technique – One minutes gaussian filter
- Computes Result – Calculate X, Y and Z components
- Display – real-time Graphical, text and directions.
- Storage – recorded in hard disk.

Screenshot

