A Method of Magnetic Induction Line Mapping and Its Applications Based on Video Analysis

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A magnetic induction line is a closed curve that depicts the magnetic field. Current research on the application of the magnetic induction line is extensive, but rarely focuses on the study of mapping the magnetic induction line. This project aims to systematically study the theories, methods, technology, and applications of magnetic induction line mapping. The project is based on the following theory: a magnet in a magnetic field creates simple harmonic vibration, and the frequency of the vibration is related to the magnetic field intensity and magnetic dipole. Thus, by calculating the vibration period and the deflection angle of the magnet after placing a second assisting magnetic field, the magnetic field intensity and direction of any certain point in the magnetic field can be calculated. Based on the theories above, this project develops a mobile phone software for magnetic induction line mapping. After recording the vibration with a camera, the software analyzes the position of the magnet in every frame, and calculates the period and the deflection angle in the vibration. In this experiment, the method measured different simple or complex magnetic fields for magnetic intensity, and mapped magnetic induction lines by determine the direction of different points. This project compared the mappings to the results from magnetometers and magnetic needles, and the mapping fit with the true results, which indicates that this method can map the magnetic induction lines in any area. Furthermore, it’s easy to operate, inexpensive, and portable. This can be applied to teaching, experiments, and magnetic mine exploration.

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