Bundesamt
für Strahlenschutz

Spotlight on EMF Research

Spotlight on “Improving the Understanding of Low Frequency Magnetic Field Exposure with Augmented Reality” by F. Soyka and J. Simons in Int. J. Env. Res. Public Health (2022)

Category [low frequency, dosimetry/exposure]

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Competence Centre Electromagnetic Fields (KEMF)

1 Putting the paper into context by the BfS

Strong magnetic fields can occur in the workplace and employees need to be aware of their extent and magnitude for occupational safety. Since the field cannot be detected without a measuring device, estimating the exposure and understanding the field extension poses great difficulties for workers and associated risks are often under- or overestimated. Augmented reality (AR) could help to visualize the electromagnetic field. Developing AR applications for EMFs might not only be a method to improve occupational safety but could also be used to improve the understanding of EMF exposure in the general public.

2 Results and conclusions from the authors perspective

The authors present a combination of measurements and visualizations of magnetic flux densities. In particular they use AR to visualize the measurements to improve the understanding of exposure levels in highly exposed workplace environments. In the first part the measuring and AR system is described and exemplary measurements for a resistance welding machine are presented. In the second part the effect of the AR visualization of the fields on the subjective and objective improvement of the exposure understanding is estimated using a survey among 15 participants and a control group.

The measuring and AR system consist of a professional hand-held measuring device and a consumer grad smartphone. The measuring system is detecting the magnetic flux density, it’s dominating frequency and the distance to the known source (the high currents of the welding machine) for predefined points.

The novelty of this approach lies in the depiction of the measured values as semi-transparent spheres on the smartphone screen. The color of the sphere indicates the relation to the limit value. An additional AR object visualizes the safety distance around the source. A second smartphone, that depicts the spheres allows for the free movement of a test person. In this way the source and the measurement points and its values can be viewed from different perspectives.

The generated images and videos are used for a report on occupational safety, which is presented to 15 persons recruited among colleagues and acquaintances. In a second step the gained understanding was tested by an online survey and compared to the results of a second group informed by a “classical” report without AR material. The first group with access to the AR material scored better in the tests and reported a lower subjective difficulty level of the test compared to the group without the AR material.

3 Comments by the BfS

According to the current state of risk communication research, exposure related information and corresponding risk messages have an influence on risk perception. This influence becomes stronger the more visually the information is presented and the closer (spatially, temporally and in real time) the measurements and their representations are to the individual, see e.g. [1-5]. Therefore, from a practical point of view, the development of an AR system can be evaluated positively. The implementation of an evaluation study is also welcome.

The reported improvement of the understanding is plausible but results should be tested with a larger representative group in the future. There are many unconsidered factors that could lead to inaccurate results in the estimated improvement of understanding among the small size of participants and their previous knowledge and the construction of the report and test. Unfortunately, the report used to train the participants is not published with the paper.

Furthermore, it would be desirable to place the "own practical experiences from the OSH environment" reported in the study in the broader context of risk communication research on EMF. On the one hand, this would mean extending the studies to include corresponding measurements of the risk perception of the test persons. On the other hand, existing empirical findings [6-8] could be taken into account and used to improve the quality of the instrument.

Nevertheless, this demonstration of AR supported measurements and communication is a direction that seems worthwhile to pursuit and, as stated by the authors, extend to other fields e.g. the RF EMF emitted by mobile phone base stations.

References

The first reference is always the manuscript at hand and the reference in the curly braces at the end of a reference {xx} correspond to a reference in the manuscript at hand and is consistent with the manuscripts reference style.

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Impressum

Bundesamt für Strahlenschutz
Postfach 10 01 49
38201 Salzgitter

Tel.: +49 30 18333-0
Fax: +49 30 18333-1885
E-Mail: spotlight@bfs.de
De-Mail: epost@bfs.de-mail.de

www.bfs.de

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