SUMMARY

Milan Horňák (Via Magna)

3D digitisation is gradually becoming a standard geodetic method applied in the creation of technical documentation within the research on archaeological and historical buildings. It is especially useful for the transformation of a 3D model into 2D space, whereby orthogonal projections of 3D structures, such as ground plans of archaeological sites, different views and cross-sections of facades of historical or other structures, are generated. Various specific views, plans and cross-sections generated from a 3D model are of high accuracy. Moreover, it is possible to capture in 3D models the exact distribution of surface colours, thanks to the recorded texture – for instance, in case of wall paintings, mosaics, etc. 3D digitisation represents a significant progress in attaining accuracy when compared to 2D photogrammetry, especially because it can correct the radial and tangential distortion of conventional photogrammetry. This allows accurate measurement of archaeological sites and findings, even of those relatively high and large in size/area (especially architectural remains). The ortho-view thus also enables presentation of complex surfaces, such as vaults with wall paintings and ornaments, and realisation of this in an advanced form, within individual areas and without any distortion due to the projection of light onto curved surface of a vault or uneven surface of archaeological finds, or due to the height of some structured in height, etc.

The 3D model as such can be utilised in a wide range of applications from virtual presentations within cultural tourism or education through simulations of spatial relationships and interference in planned reconstructions up to simulations within the framework of crisis management in calculations of flood water risks etc. Repeated 3D digitisation can also capture a construction development of an object, or changes in structural conditions (e.g. shifts, cracks, etc.), so the technology can be used also for monitoring of the conditions

of historical building structures. The procedure of archaeological research can be in this way also “tangibly” recorded in the process of exploitation of individual surface levels.

Terrestrial laser scanning remains to be the most reliable method from among individual technologies of 3D documentation. This is related especially to the verifiable calibration-conditioned guarantee of accuracy as well as with the process of data collection, which by its technologic nature minimises the level of noise in the resulting model. On the other hand, TLS has also many negative factors. Probably the most significant is the price, which can be the main obstacle for wider application in the field of cultural heritage. Limited manipulation on elevated platforms also limits more extensive possibilities of application in the recording of high structures, where digitisation shadows can form in places of important structural elements. The resulting texture of model surface also poses a problem, as TLS scanners usually have weak photo sensors. The technology of structured light, which is close to the method of IbM, has been recently started to be applied especially in the case of portable scanners. Scanners equipped with this technology find wide application in the documentation of movable objects or immovable objects not exceeding 2 – 3 m. They can be used in the field of the cultural heritage especially for documentation of museum exhibits or movable findings and historical sculptures. The digitisation can be performed in the interior without the usage of any special lighting.

Currently, the method of IbM experiences the biggest boom in use. The recent rapid development of low-cost or open-source software for the creation of spatial models from series of images pushed IbM up the list of choices of the methods of recording in the process of preparation for the reconstruction of buildings, documentation of archaeological research, as well as overall monitoring and protection of historical heritage. This technology is versatile and has a range of possible applications. It can be equally useful for the digitisation of extensive archaeological sites and historical building complexes, as well as for small, movable findings. The mass expansion of this technology is also considerably facilitated by the user-friendly interface of the majority of software packages, as well as by the option to use supporting tools for the collection of data (monopod stand, microcopter). When using this documentation technology, it is necessary to scrutinise the quality of the input data, i.e. photos. The photo-documentation and its processing require special attention, because it is their quality that determines the success of the entire digitisation project.

In the CONPRA project we have, hopefully, demonstrated that all the technologies used and described and our papers became highly accessible and user friendly. Prior the project, none of the authors could be cosidedered expert in these fields, however, soon they started to master new technologies and use them in their routine work.