Some Comments on the Relations of Photogrammetry and Industry *)

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Though my career was mainly at university, I always liked to, tried to and succeeded in having cooperations with government agencies and industry. The motivation is simple: They have questions I would never pose, but which require more than just putting some software together. The following few lines reflect the relations between basic and applied research and developments at universities and in industry in our photogrammetric field.

Overlap of university and industry research

The link between photogrammetry and industry is a clear one: photogrammetry is an engineering discipline - now more and more overlapping with computer vision, though having its own scopes - and therefore always aims at trying to bring theories to practice, i.e. into industry. Research in our very small field always had to compete with large companies, especially those who had bosses who looked into the future and allowed for (comparably) risky developments. This is certainly true for all hardware developments, which only to a very small percentage are made at Universities. Today these companies more and more are global players (Google, Microsoft, Facebook, Apple) who try to get the crème de la crème of the scientists into their research and development groups (since 20 years or more), paying them excellently, and allowing and encouraging them to publish: at least 10 % of the papers on computer vision conferences come from these companies, they also have booths at the industrial exhibitions, and special evening events - quite like at large ISPRS events or others, such the Photogrammetric Week. They address all aspects of mapping in the last years, e.g. Google has made public code available for bundle adjustment to be performed locally or in the cloud (Ceres solver: http://ceres-solver.org/tutorial.html) - which of course was motivated by the need to evaluate all the street map data.

Lack of long term research

The small size of our community and the diversity of applications we want to address leads to a lack of depth of developments in many aspects. At the same time all excellent work which is published needs to be highly appreciated. But the gap between computer vision industry and photogrammetric industry is difficult to bridge (only referring to those areas which overlap, eg not the topic of biometric pattern recognition etc) : the requirements of small companies (mostly photogrammetric ones) often are short term, researches think this is fine, motivate PhD theses to cover the mid term part, but sometimes forget the risky long term part of the research and development. The large companies can afford to have research groups without specific application goal for the next 2-3 years (autonomous driving is a classical counter example, which requires the will to invest into long term research).

Publications as documented interface

Journals can improve awareness by getting not too short, but stimulating reports in conferences not only photogrammetric ones, but such conferences which are attended by photogrammetrists who publish in photogrammetric journals: this refers to local

conferences, e.g. BMVC, but also European and international ones. The awareness also touches the quality and openness of the papers published, i.e. accepted by the reviewers for publication. I needed about three years (1990-1993) to learn how to review in double blind review processes in the pattern recognition area. Often papers are published which use method X applied to Y in context Z, which is interesting to the authors and those who want to have an overview on what happens in the world, but which does not provide any insight for the readers and progress of our field since generalization is either not possible or not provided by the paper. The quality of reviewing has highly improved in the last 20 years (see the guidelines for this years CVPR, which could easily be adapted to guidelines for reviewing journal papers; http://cvpr2017.thecvf.com/submission/main_conference/reviewer_guidelines). But I fear developers in industry still need to perform quite some own benchmarking before being able to judge, whether the result of scientific papers is useful for them.

Outlook

In my view, universities have the privilege to follow the natural curiosity within basic research (see Abraham Flexner: 'The usefulness of useless knowledge', Harpers, issue 179, 1939). In an engineering discipline, as ours, the links to industry are natural and can be extremely fruitful. The -- in the meantime -- long and broad -- bridge between university research and industrial developments needs several pillars to carry the knowledge traffic in both directions.

*) a response to the editor of the Photogrammetric Record, Stuart Granshaw, on `` thoughts on photogrammetry and industry'' especially the ``current lack of interaction between academia and industry in photogrammetry and related areas.