European Commission

This fiche is part of the wider roadmap for cross-cutting KETs activities

'Cross-cutting KETs' activities bring together and integrate different KETs and reflect the interdisciplinary nature of technological development. They have the potential to lead to unforeseen advances and new markets, and are important contributors to new technological components or products.

The complete roadmap for cross-cutting KETs activities can be downloaded from:

http://ec.europa.eu/growth/industry/key-enabling-technologies/eu-actions/ro-ckets

Potential areas of industrial interest relevant for cross-cutting KETs in the Training, Education and Edutainment domain

This innovation field is part of the wider roadmap for cross-cutting KETs activities developed within the framework of the RO-cKETs study. The roadmap for cross-cutting KETs activities identifies the potential innovation fields of industrial interest relevant for cross-cutting KETs in a broad range of industrial sectors relevant for the European economy.

The roadmap has been developed starting from actual market needs and industrial challenges in a broad range of industrial sectors relevant for the European economy. The roadmapping activity has focused on exploring potential innovation areas in terms of products, processes or services with respect to which the cross-fertilization between KETs can provide an added value, taking into account the main market drivers for each of those innovation areas as well as the societal and economic context in which they locate.

Taking the demand side as a starting point, cross-cutting KETs activities will in general include activities closer to market and applications. The study focused on identifying potential innovation areas of industrial interest implying Technology Readiness Levels of between 4 and 8.

EDU.1.1: Characteristic (e.g. human) motion detection in computer vision

Scope:

To develop characteristic (e.g. human) motion detection in computer vision characterized by real-time performance, insensitivity to background clutter and movement, and a modular design that can be generalized to other types of motion aimed at various higher-level applications (including automatic motion capture for film and television, human-computer interaction, robotics, industrial machine vision, navigation, events detection, surveillance, etc.).

Demand-side requirements (stemming from Societal Challenges) addressed:

- Tackle the "Inclusive, innovative and secure societies" societal challenge

Demand-side requirements (stemming from market needs) addressed:

- Reliably detect and track human motion for higher-level applications that rely on visual input (such as automatic motion capture for film and television, human-computer interaction, robotics, industrial machine vision, navigation, events detection, surveillance, etc.)
- Interaction with humans and understanding of their activities as the core of many problems in intelligent systems

Specific technical/industrial challenges (mainly resulting from gaps in technological capacities:

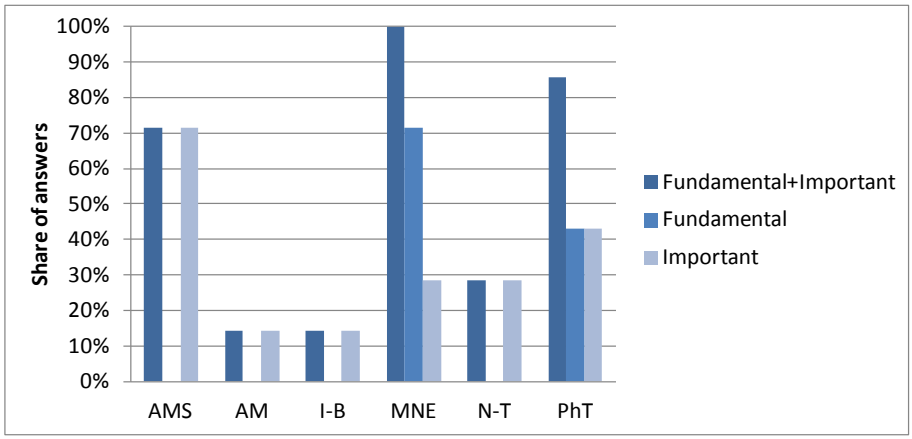
- Development of accurate algorithms for human motion tracking and detection which can digest high-bandwidth video into a compact description of the human presence in a scene
- Development of a model of motion that accurately represents human motion
- Use motion to obtaining other characteristics such as, for instance, object shape, speed or trajectory, which are meaningful for detection and recognition
- Development of whole computer programs to capture and convert movements of arbitrary objects (which can be a human mounted with positioning labels) into quantitative parameters (e.g. point-to-point distance and joint orientation)
- Feature extraction of the acquired images using image processing techniques
- Reconstruct the human gestures based on a sufficient number of feature points

Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the development of more advanced characteristic (e.g. human) motion detection systems for computer vision, building on more advanced, high-performance motion sensors characterized by real-time detection and high accuracy.

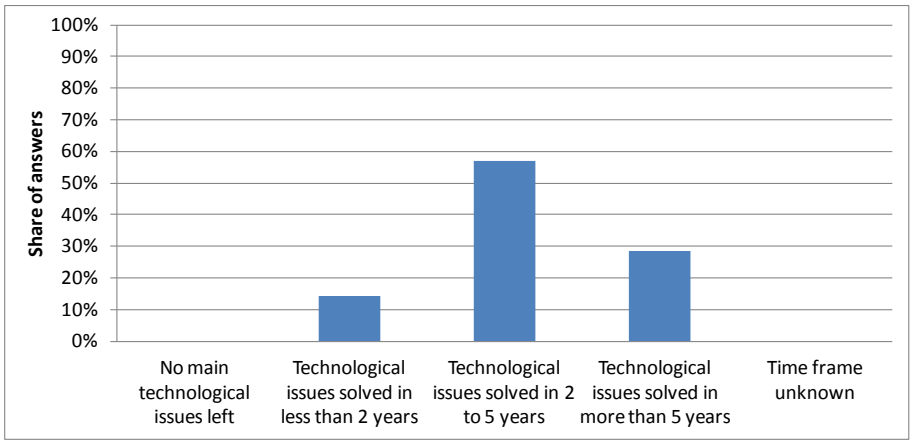
To this aim, the combination of KETs experts' opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this Innovation Field, and desk research activities, have allowed identifying a rather strong interaction of KETs with respect to this Innovation Field, with either fundamental or important contribution mainly by the following KETs:

- Micro- and Nano-Electronics (MNE)
- Photonics (PhT)
- Advanced Manufacturing Systems (AMS)



Timing for implementation:

According to the majority of KETs experts' opinions (whose result is depicted in the below bar chart), desk research, and in line with the KETs-related patenting activity in this field, it is considered that the main technological issues holding back the achievement of cross-cutting KETs based products related to this Innovation Field could be solved in a time frame of 2 to 5 years:



Hence, depending on the specific technical and/or industrial challenges holding back the achievement of cross-cutting KETs based products related to this Innovation Field, the provision of support in the short term should be taken into consideration within this framework.

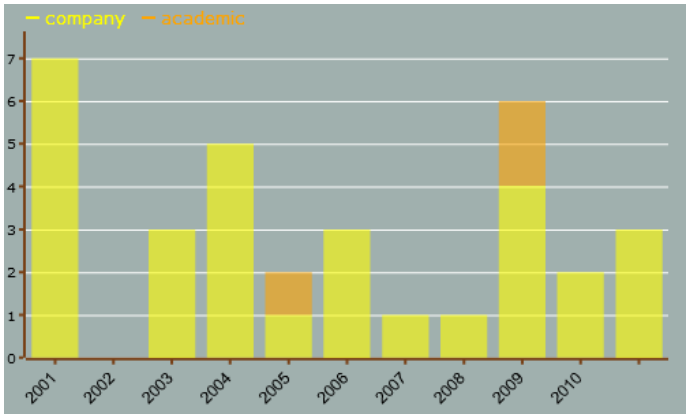
Additional information according to results of assessment:

- ***Impact assessment:***
  - Innovative researches are ongoing towards new directions which can link to contactless interactive educational learning. Events of experiencing the human body through responding to various real-time motion gestures of audiences were applied, and it was manufactured as a system of human body being a one whole interface. By reproducing the roles and states of actual organs in the form of active simulation, a maximization of the experience learning effect can be reached. This user-based interactive education contents will propose ways of participation in edutainment design and new ways to educational learning. This will not be just a simple interaction, but play a role of expanding the field of education (Source: S. Hong, H. Yi Jung, U. Kim, Research on Real-Time Contents for Human Body Experience Edutainment, Advanced Science and Technology Letters Vol.46 (Games and Graphics 2014), pp.285-291).
  - The defence sector is the leader in development of high-performance sensors and systems. Military innovations are increasingly being industrialised for the consumer applications. CBRNE (Chemical, Biological, Radiological, Nuclear, Explosive) sensor development is transferring military technology to civilian security applications. In return, defence benefits from the technology progress in silicon-based

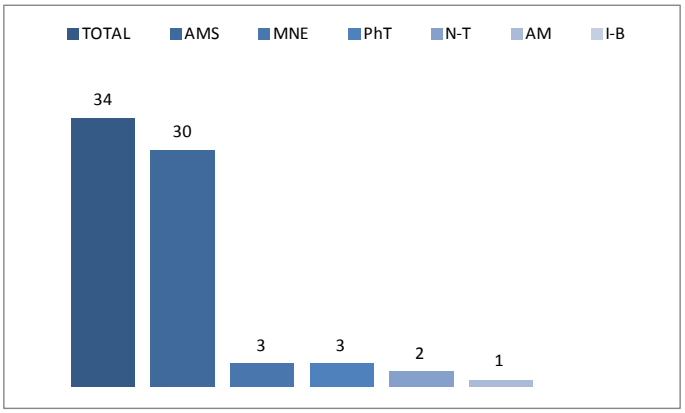
components supported by the consumer market. This virtuous circle is a key element in the sustained growth of photonic sensors (European Photonics Industry Consortium – Vision paper photonic sensors).

➢ ***Results of patents scenario analysis:***

- 34 exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field
- Almost stable trend curve (number of patents per year) with peaks and a generally low patenting activity per year
- Highest share of industrial applicants:



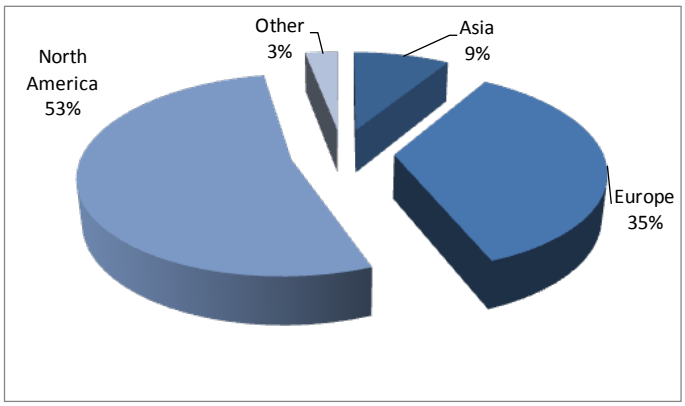
- Patents by KET(s):



- Patents by KET(s) and relevant combinations of KETs:

KET(s)	*Number of patents*
AM	1
AM / N-T	1
AMS	30
AMS / MNE	2
AMS / PhT	1
MNE	3
MNE / PhT	1
N-T	2
PhT	3

- Patent distribution by (Applicant) organization geographical zone:



- Patent distribution by geographical zone of priority protection: