SCIENCE AND ENGINEERING RESEARCH COUNCIL
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Technical Policies in Computer Graphics                      I D Benest
Image Processing and Man-Machine Interface                   19 October 1982

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SCIENCE AND ENGINEERING RESEARCH COUNCIL

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Technical Policies in Computer Graphics,
Image Processing and Man-Machine Interface

PREFACE

1.  This paper presents initial policies in the areas of computer
graphics, image processing and man-machine interface.

COMPUTER GRAPHICS TECHNICAL POLICY

2.  The following are considered to be areas in computer graphics which
merit further research:

    a.  All aspects of raster graphics including anti-aliasing
        algorithms and device independence.

    b.  Methods for presenting stereoscopic images.

    c.  Metafiles.

    d.  Developing techniques for formally specifying and
        verifying graphics systems, including the analysis of
        the applicability of existing specification techniques.

    e.  Surface modelling for 3D graphics (eg. fractal techniques),
        texturing.

    f.  Geometric modelling.

    g.  Algorithms.

    h.  Development of reference systems for computer graphics.

    i.  Computer animation, particularly the specification of
        interrelated dynamics and artistic quality.

    j.  Human movement.

    k.  Hardware for computer graphics (integrated circuits for
        manipulation of 3D objects, clipping dividers, real time
        perspective rotation of solid objects using parallel
        processors).

    l.  Business graphics including techniques for presentation,
        and evaluation of their usefulness.

## IMAGE PROCESSING TECHNICAL POLICY

3.  This area covers the processing of image data (including waveforms and any other patterns), with particular emphasis on analysis and interpretation. The activities in this area are concerned with fundamental research in image analysis in support of all application areas, with research aspects of image processing algorithm implementation and with selected application areas of image processing. In the context of the Alvey programme, image processing plays an important role in MMI and in external capabilities system (sensory data processor) for IKBS.  The main research topics cover techniques for:

a.  Image pre-processing: filtering, enhancement transforms for image representation, image correction, image restoration.

b.  Low level image analysis: image segmentation, multispectral/multichannel data classification, attribute extraction, image primitive extraction, texture analysis, shape analysis.

c.  High level image interpretation: statistical, syntactic and hybrid pattern recognition, relaxation processes, constraint labelling, the use of context, picture languages.

d.  Image coding: via image analysis and for image analysis.

e.  Image modelling: statistical modelling, modelling of line structured data, 3D object modelling, relationship between images and world models, pictorial databases.

f.  Analysis of image sequences.

g.  General computer vision and multisensor fusion (integration of intrinsic images).

h.  Novel architectures for image processing.

i.  Application of image processing in information technology related areas.

MAN MACHINE INTERFACE TECHNICAL POLICY

4.   Where there is a requirement for man to operate  a  machine,  there
exists a  man-machine interface, and by that definition all interactive
programs are the concern of the MMI field.  In practice, MMI covers the
formal dialogue design and the psychological and physiological needs of
the human being when  interacting  with  the  machine.   The  following
topics are  broadly in line with those recommended by the Alvey Working
Party on Man-Machine Interface:

    a.    Improving communication techniques and devices (eg speech
        recognition, text to speech synthesis, pictorial input
        and output) including the use of knowledge base techniques
        to provide 'intelligent' speech and character recognition.

    b.    Studying the relative roles of man and machine in complex
        tasks and analysing human problem solving behaviour in
        such situations.

    c.    Integrating and comparing multi-media communication
        techniques.

    d.    Studying both man-machine communication and man to man
        communication via a machine intermediary.

    e.    Developing models of the user.

    f.    Developing dialogues to suit a wide range of abilities and
        activities.

    g.    Studying the manipulation of systems which are characterised
        by group activity under conditions of potentially high stress
        and mental work load.

    h.    Reviewing fatigue factors which are attributable to
        prolonged usage of visual displays.

    i.    Developing techniques to reduce the spatial constriction
        imposed by visual display screens when navigating large
        information areas.

    j.    Developing interactive languages which enable users to
        tailor the interface to match specific skills and
        requirements.

    k.    Identifying the factors which make human experts effective
        at communicating their expertise to other people and in so
        doing, developing techniques for computer-aided instruction.

    l.    Developing techniques for measuring and evaluating
        man-machine interfaces.

COMMON POLICY

5.   All three areas should also support:

     a.   the production of software whose development is principally
          aimed at providing tools for researchers in the specific
          area.

     b.   the evaluation of new hardware on behalf of the wider
          community.

     c.   the development of algorithms in silicon.

CCSC DECISIONS

6.   The committee is asked to accept the above technical policies in
computer graphics, image processing and MMI.

15 October 1982
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