C7 Image Processing, Image Analysis and Computer Vision

Time: Tuesday, 14.09.2010, 3:50 p.m.
Location: Humboldt-Building, Lecture Room 012/ Foyer

Poster Session:

Chairman: T. Machleidt (DE-Ilmenau)

A. Tamelo, V. Muravev, D. Molodkin (BY-Minsk)

Improving images at radiovision in millimetric wave length

Illumination of the latent objects at formation images in millimetric and submillimetric (mm and smm) ranges of lengths of waves is necessary owing to small contrast, especially in the closed premises. Now importance of the decision of these questions has increased because of working out of technologies of multielement sensor controls of mm of a range, and also thanks to constantly increasing value practical use methods and systems of formation of images. Active illumination of observable objects allows to solve a problem of low contrast of passive (radiometric) images in mm range, and also provides transfer on an intake of the computer analysis (CA) essentially great volumes of the information about masked objects, than what can be received by means of use traditional radiometric CA. Various approaches to reception of active (highlighted) images of sufficient visual quality and the information maintenance in various frequency ranges, beginning from microwave (30 GHz) and to smm a range (300 GHz), are described in variety of works. On image distortion in mm and smm ranges considerable influence renders spatial effect of Gibbs. Theoretically also possibilities of synthesising of images high visual qualities in wide (mm and smm) a range of lengths of waves are experimentally shown. In the used scheme of multifrequency formation of images there are no devices for destruction spatial coherent radiations, and radiation changing on frequency directly shines objects in a subject plane (at normal falling of a flat shining wave on a plane). Thus as a source of radiation changing on frequency the lamps of a return wave blocking a range of 52-119 GHz were used. Test objects masked the teflon plates homogeneous for a thickness, not allowing to observe objects in visible light. Distinctive features of quasioptical display in mm a range of real objects with the considered spatial sizes are defined by fundamental bases of formation of coherent images which for range mm start to get the important practical value. The synthesised image received as a result of total accumulation of signals of five unifrequent images adequately enough displays as spatial structure, and brightness distribution in observable object, though and with contrast decrease.

A. Göpfert, M. Rückwardt, M. Rosenberger, M. Correns, M. Schellhorn, G. Linß (DE-Ilmenau)

A new inner 360° measurement procedure for three-dimensional geometrical measurements

Inspection and measurement of geometrical quantities is a wide complex field. An example is three dimensional measurement of the groove from spectacle frames. Every groove is an undercut in material of the spectacle frame and therefore the direct optical path of coordinate measuring machines is blocked. A known measurement procedure is a combination of optical measurement and a plane mirror for beam deflection. Disadvantages of this method

are a limited field of view and also a long testing time. A solution is a cone mirror in combination with a high resolution camera-system. With this kind of beam deflection a simultaneous measurement of 360° is possible. The angle of the frame in polar coordinates is given by special image detection algorithms and backtracking of the form of the cone mirror. The distance of the associated measuring point can be detected by an autofocus for every detected point in the image. This combination of camera-system, beam deflection and software algorithms is an advancement in speeding up optical measurement of spectacle frames.

M. Rückwardt, A. Göpfert, M. Schellhorn, M. Correns, M. Rosenberger, G. Linß (DE-Ilmenau)

A modern inside optical detection and measuring proceeding for for the three-dimensional ground of a groove

Accurate measuring of spectacle frames is an important field of quality assurance for opticians and their customers. Different supplier for spectacle frames and a number of measuring methods are available on the market but all of them are tactile ones. In this paper there will be a short overview on a possible optical measuring method for detecting the groove of a spectacle frame. The main challenge for an optical measuring machine is the blocked optical path, because the device under test is located behind an undercut. In this case it is necessary to deflect the beam of the machine. In this study it is done with a rotating plane mirror. In the next step the difficulties of machine vision connecting to the spectacle frame are explained and some first results are given. But the main focus of this paper is on the image processing for finding stable measuring points on the ground of the groove of the spectacle frame. Therefore the demand is discussed of several steps of contour tracking for following the frame with its obstacle. Also the different filters and their combination for finding the measuring points is explained. Finally a three dimensional curve of the groove of the spectacle frame is spent.

D. Swarat, H.-G. Lipinski (DE-Dortmund), M. Wiemann (DE-Marl)

Monto Carlo Simulation of nanoparticle tracking under cell culture conditions studied by image based analysis

Nanoparticles (NP) are increasingly important for industrial and medical applications. However, some clinical findings suggest a possible health hazard of NP, prompting the examination of NP in cell culture experiments, where the behaviour of NP (changes of shape or size by agglomeration) needs to be described. To visualize NP within the culture media we use the NanoSight™ device which optically tracks the Brownian motion of NP illuminated by a specially configured laser beam. Motion of NP was captured as a sequence of images, from which NP light scattering intensity can be derived and particle size can be computed using the Stokes-Einstein relation. Since the Nano-Sight™ method reduces the Brownian motion from three to two spatial dimensions, we studied the influence of this reduction on the calculation of NP size by a Monte Carlo model which simulated the Brownian motions of NP in a virtual liquid. Illumination, scattering, and particle motion of the virtual scene were adapted to real measurements. Image sequences derived from virtual scenes were analysed in three and two spatial dimensions according to the NanoSight™ method. We found that the 3D simulation model matched the experimental situation. Furthermore the created

simulation can be used to get superior results about the spatial dimension reduction effect. Using the simulation it is possible to locate each single particle and to identify any particle at any time, especially in cases of collision, agglomeration or optical interference. Therefore, parameters of each particle such as illumination, scattering, and particle motion can be obtained from the simulation scene more accurately than from 2D original data.