

53. IWK

Internationales Wissenschaftliches Kolloquium
International Scientific Colloquium



Faculty of
Mechanical Engineering



.....
PROSPECTS IN MECHANICAL ENGINEERING

8 - 12 September 2008

www.tu-ilmenau.de

th
TECHNISCHE UNIVERSITÄT
ILMENAU

Home / Index:

<http://www.db-thueringen.de/servlets/DocumentServlet?id=17534>

Published by Impressum

Publisher
Herausgeber Der Rektor der Technischen Universität Ilmenau
Univ.-Prof. Dr. rer. nat. habil. Dr. h. c. Prof. h. c. Peter Scharff

Editor
Redaktion Referat Marketing und Studentische Angelegenheiten
Andrea Schneider

Fakultät für Maschinenbau
Univ.-Prof. Dr.-Ing. habil. Peter Kurz,
Univ.-Prof. Dr.-Ing. habil. Rainer Grünwald,
Univ.-Prof. Dr.-Ing. habil. Prof. h. c. Dr. h. c. mult. Gerd Jäger,
Dr.-Ing Beate Schlütter,
Dipl.-Ing. Silke Stauche

Editorial Deadline
Redaktionsschluss 17. August 2008

Publishing House
Verlag Verlag ISLE, Betriebsstätte des ISLE e.V.
Werner-von-Siemens-Str. 16, 98693 Ilmenau

CD-ROM-Version:

Implementation
Realisierung Technische Universität Ilmenau
Christian Weigel, Helge Drumm

Production
Herstellung CDA Datenträger Albrechts GmbH, 98529 Suhl/Albrechts

ISBN: 978-3-938843-40-6 (CD-ROM-Version)

Online-Version:

Implementation
Realisierung Universitätsbibliothek Ilmenau
[ilmedia](#)
Postfach 10 05 65
98684 Ilmenau

© Technische Universität Ilmenau (Thür.) 2008

The content of the CD-ROM and online-documents are copyright protected by law.
Der Inhalt der CD-ROM und die Online-Dokumente sind urheberrechtlich geschützt.

Home / Index:

<http://www.db-thueringen.de/servlets/DocumentServlet?id=17534>

S. Karpovich / I. Dainiak / V. Jarski

Automatic Mechatronic Complex for the Forming of 3D Multi-Point Structures

INTRODUCTION

The paper is dedicated to precision mechatronic complex for laser technologies: for the forming of 3D multi-point structures inside of transparent dielectrics by means of focused laser beam.

MECHATRONIC COMPLEX STRUCTURE

The structure of mechatronic complex, which used for the forming of 3D multi-point structures inside of volume of transparent dielectrics, for example, glass, is presented on Fig.1.

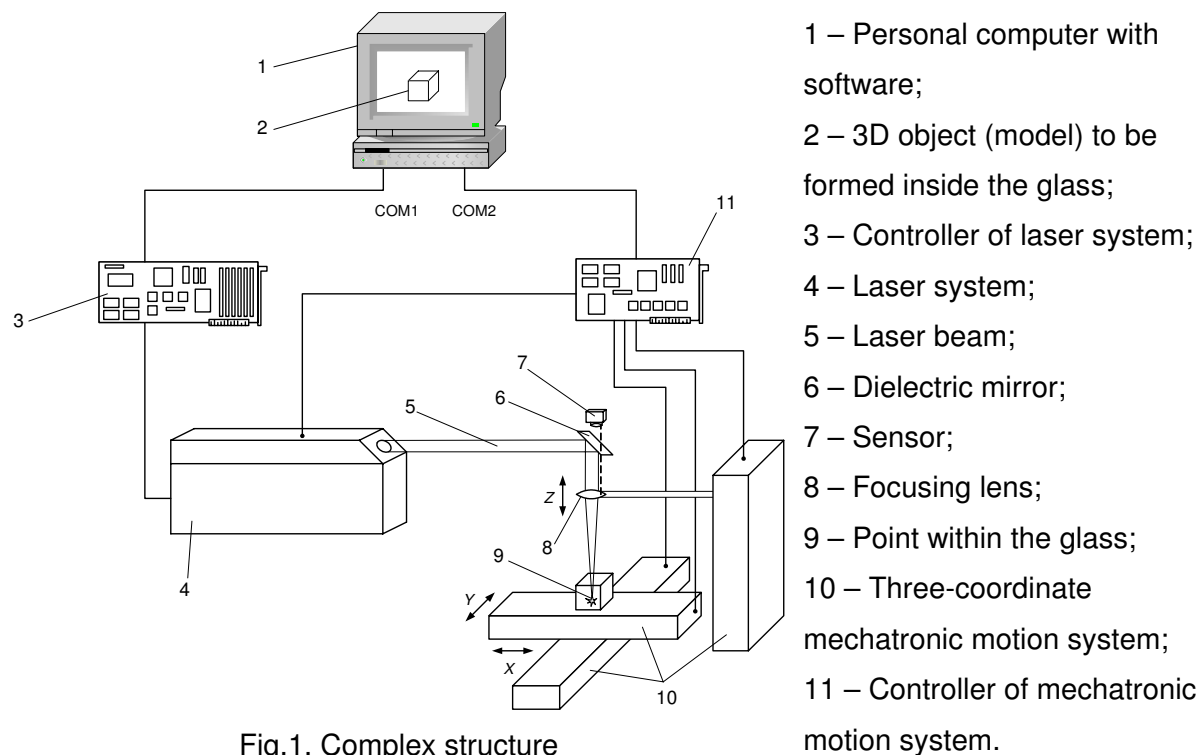


Fig.1. Complex structure

The main task of mechatronic motion system is to realizing of precision motions, which should be synchronized with pulsed laser system, through all points inside the glass. Two work modes could be possible:

1) *start-stop* – in every point system stops and waits for laser impulse;

2) *continuous* – uninterrupted motion through all 3D-points.

The second mode is preferable, because it allows increasing of forming process productivity and reducing the forming process time. Our experimental investigations confirmed that the continuous motions provide the forming more than 90 points per second when the 100 Hz-laser system is used.

MECHATRONIC COMPLEX SOFTWARE STRUCTURE

The software structure consists of 3 level:

– low-level controller software;

– 3D-trajectory planning program;

– high-level PC-software for editing, handling and preparing of 3D multi-point structures.

The general algorithm of motion realization includes follows steps:

1) re-ordering of point array, because bottom points should be formed by laser beam before top points;

2) sorting of point array, since coordinate system should pass through the all points on minimal distance;

3) forming the motion trajectory in 3D-space, using spline interpolation algorithms;

4) with velocity profile (usually, trapezium or triangle), trajectory is synchronized by timer, according to the frequency of laser impulses;

5) building of motion program and sending to the controller of mechatronic motion system.

Additionally, the software controls the laser system at the technological process, automatically traces all errors of motion system and laser system, and allows to continue the process after its breaking by operator.

Authors:

Prof., Dr. Eng., habil Sviataslav Karpovich

Dipl. Eng., PhD. Igar Dainiak

PhD. Vladimir Jarski

Department of Mathematics

Laboratory of Mathematical Modelling of Technical Systems

Belarusian State University of Informatics and Radioelectronics

P.Browki Str, 6

220013 Minsk, Belarus

Phone: +375 17 293-88-30

Fax: +375 17 202-10-33

E-mail: mmts@bsuir.by