



# HUMAN-COMPUTER INTERACTION

## Lecturer

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# Human mistakes

1. 42% abnormal situations in industrial systems

<https://wonderwarepaocwest.com/news/operatr-five-contributing-factors-human-error/>

2. Accidents of 45% for nuclear plants, 60% - aviation crashes, 80% - sea disasters and 90% - car accidents

Muratov O., Tihonov M. The human factor at nuclear object, 2008  
<http://www.proatom.ru/modules.php?name=News&file=print&sid=1555>

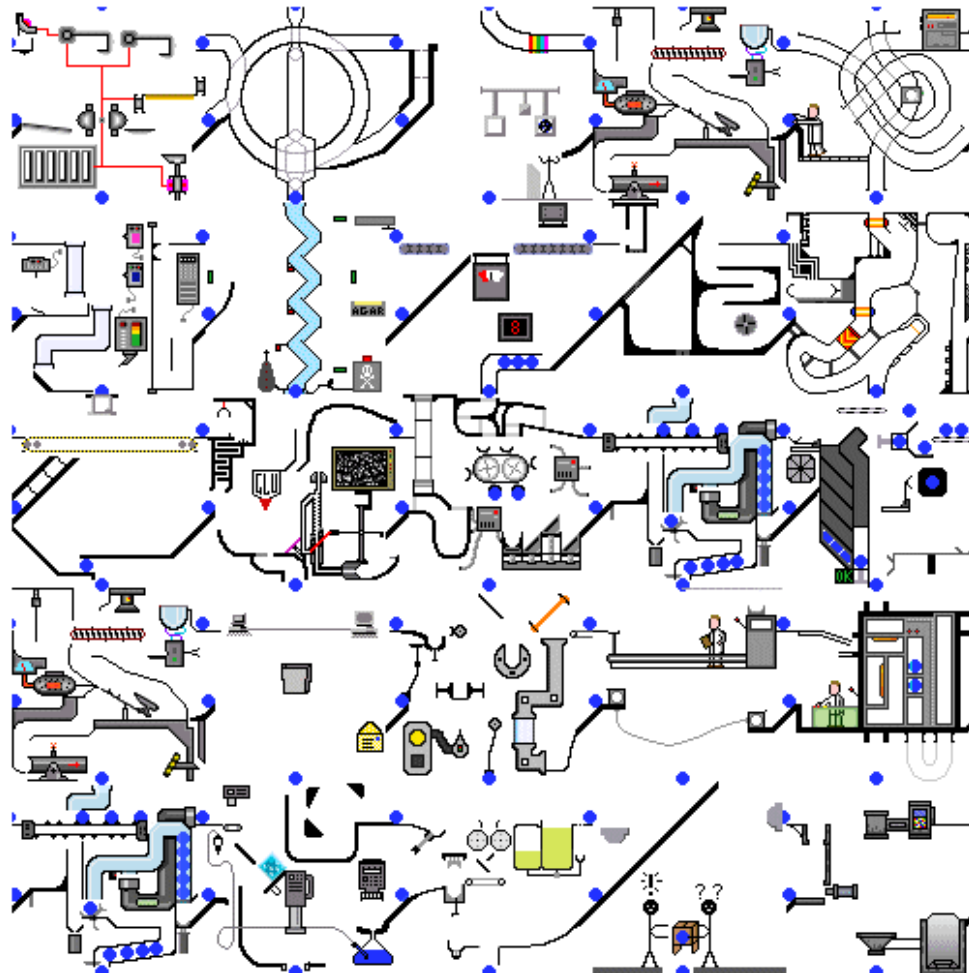
3. Abnormal situations cost the petrochemical industry \$10B (US) annually in preventable losses

Cochran, E., and Bullemer, P. Abnormal Conditions Management: Not by New Technology Alone, Proceeding of the AIChE Safety Conference, Houston, TX, 1996

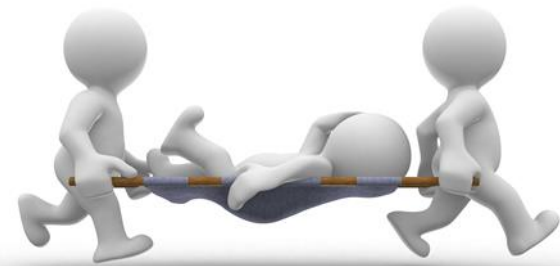
4. 80 to 85% of human errors in chemical production result from poor design of the working environment

Lorenzo, D.K. A manager's guide to reducing human errors: Improving human performance in the chemical industry. Arlington, VA: Chemical Manufacturer's Association. 1990

# Operator's brain damage



[www.snymans.comtransfer-processsimple-transfe](http://www.snymans.comtransfer-processsimple-transfe)



# COURSE DESCRIPTION

**Course name:** Human-computer interaction

**Module name:** GUI development

**Study cycle:** bachelor

**Semester:** 3

**Duration:** 12 weeks

**Lectures:** 24

**Lab works:** 24

**Consultations:** 22



# AUTHOR'S COURSE MATERIAL

**С.М. СЕРДЮК**



## **ЕРГОНОМІЧНІ**

### **ПИТАННЯ ПРОЕКТУВАННЯ ЛЮДИНО- МАШИННИХ СИСТЕМ**

## **ЛЮДИНО-МАШИННА ВЗАЄМОДІЯ**



Tempus

Курс лекцій



К.т.н., доцент Сердюк С.М.



2015

# AUTHOR'S COURSE MATERIAL

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ  
Запорізький національний технічний університет



## МЕТОДИЧНІ ВКАЗІВКИ

до лабораторних робіт  
з дисципліни

“Людино-машинна взаємодія”  
для студентів

спеціальності 7.05010301

“Програмне забезпечення систем ”

та 7.05010302 “Інженерія програмного забезпечення ”

денної форми навчання

2015

[http://moodle.zntu.edu.ua/pluginfile.php/607/mod\\_resource/content/1/Лекции\\_ЛМВ\\_УКР\\_2015.pdf](http://moodle.zntu.edu.ua/pluginfile.php/607/mod_resource/content/1/Лекции_ЛМВ_УКР_2015.pdf)

[http://moodle.zntu.edu.ua/pluginfile.php/606/mod\\_resource/content/1/HMI\\_LAB\\_15.pdf](http://moodle.zntu.edu.ua/pluginfile.php/606/mod_resource/content/1/HMI_LAB_15.pdf)



# Aims of the course competences

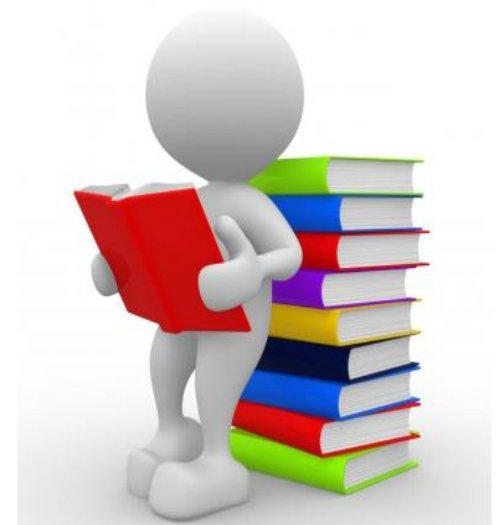
- Training for MMS psycho-engineering and ergonomic design methods
- Training for Ecological Interface (Task-Based Interface) design methods
- Providing capability for Embedded Systems GUI development



# Learning outcomes

**1.** Understanding of ergonomic requirements for each component of the "Man-Machine-Environment" systems, such as:

- Human operator;
- Technical facilities;
- Workplaces;
- Production environment





# Learning outcomes

2. Knowledge about operator's activity formalization and modeling methods are applicable to Embedded System
3. Knowledge about System-Ergonomic Analysis of Domain methods
4. Knowledge about Control System HMI design process
5. Knowledge about GUI development
6. Knowledge about usability testing



# Lectures structure

**Introduction**

**PART1. MMS ergonomic design**

**PART2. Control System HMI design**

**PART3. Embedded System GUI  
development**



# Lab works

## Lab works №1

### Methodical techniques for the System-Ergonomic Analysis of Domain

1.1 Functional analysis

1.2 Allocation of functions between human and machine

1.3 Human task and job analysis



# Lab works

## Lab works №2

# The method of GUI structure, form and layout development

2.1 The goals and operations of interface definition

2.2 Visual hierarchy and visual stream of the interface

2.3 Clustering and alignment of interface elements

2.4 Templates for screen layout



# Lab works

## Lab works №3

### The choice of GUI controls

- 3.1 Basic principles of human-machine interaction
- 3.2 Assortment of GUI controls elements
- 3.3 Recommendations for choosing a GUI controls
- 3.4 GUI coding



# Lab works

## Lab works №4

### **Informative graphics. Interface design processing**

- 4.1 The models of informational layout
- 4.2 Elements of visualization
- 4.3 Data sorting, searching and filtering
- 4.4 The methods of data concretization



# Diploma project

## CNC machine Sinumerik 840D HMI development

student KNT-410  
Snigko Roman

2014



# Main windows

The screenshot displays the SINUMERIK-840D control interface. On the left, a text area shows the following program code:

```
1A516M*3A.197.CNC-H-645, 198.04.05.009-6602 op.25
%125
N901L99T0101
N1P1.70P2.218.8
N2TX1=P1TZ1=P2
N3G27G54
N4G0G94G90X725.5G90Z127.825S9M41M4
N5G1Z79.225F500M8
N6G95X654.05F0.25
N7G0Z127.825M9
N8M5
N9G32Z
N10M0
N801L99T0101
N11P1.70P2.218.8
N12TX1=P1TZ1=P2
N13G27G54
N14G0G94G90X725.5G90Z127.825S9M41M4
N15G1Z79.825F500M8
N16G95Z76.022F0.2
N17G94Z79.025F100
N18G95X654.05F0.2
N19G0Z127.825M9
N20M5
N21G32Z
N22M0
N902L99T0202
N23P1.-73.8P2.220
N24TX2=P1TZ2=P2
N25G27G54
N26G0G94G90X663.25G90Z127.825S9M41M4
N27G1Z80.825F500M8
N28G95Z68.175F0.25
N29G94X660.25F100
N30Z80.825F500
```

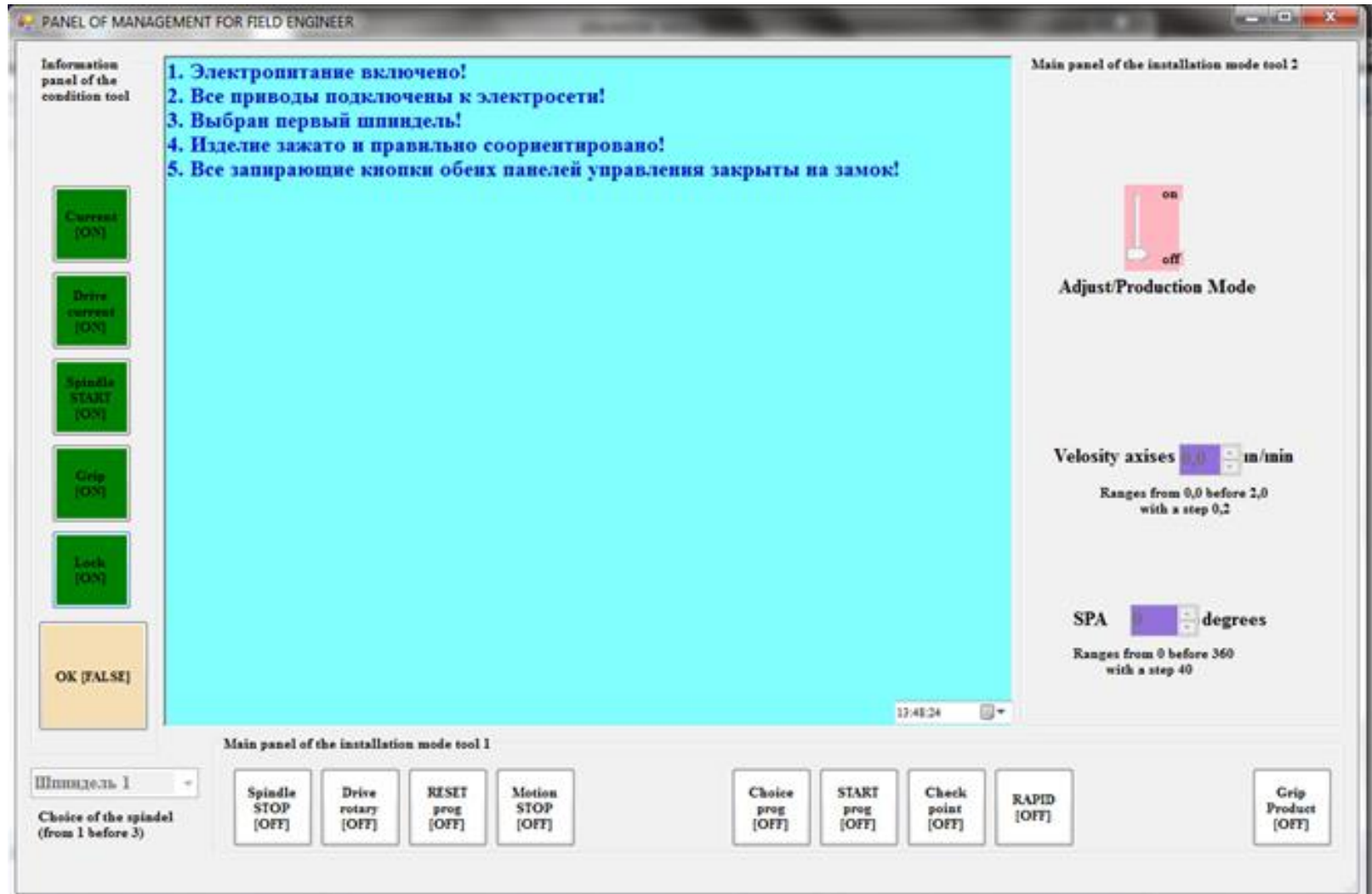
The interface includes several control panels:

- Properties:** Spindel Value (ob/min), Feedrate Value (mm/ob), and SafetyPlane Value (mm).
- ManualMode:** Includes Feed Start/Stop, Spind Start/Stop, and a Joystick with Up, Down, Left, and Right directions.
- Door:** Door Open and Door Close buttons.
- Cutting Parameters:** Radio buttons for Spindel, Feedrate, and SafetyPlane, with a Set button.
- ModePanel:** A selector between MANUAL and AUTOMATIC modes.
- Buttons:** START (green), STOP (red), On/Off (yellow), KEY (yellow), Load Program (blue), and Check Program (yellow).

At the bottom, there is a green progress bar and a dropdown menu labeled "Program2".



# Serviceman's HMI



# Contact

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