Automation and Robotics in the Context of Industry 4.0: The Shift to Collaborative Robots

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Introduction

This paper presents the material describing the role and place of collaborative robotics in the automation of production in the conditions of rapid development of industry. The collaboration of human and robot in close proximity in a single workspace is a stimulating feature of Industry 4.0 concept.
Safety issues and related risks for industrial human-robot collaboration
List of potential risks of hazardous from human-robot interaction during collaboration

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<th>Type of risks of hazardous</th>
<th>Description</th>
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| **Risk of hazardous from robot** | Taken into account:  
  - distance between the human operator and the work in collaborative work space  
  - the trajectory passed by the robot and obstacles in the path of the robot  
  - speed of the human operator and the slow reaction of the robot  
  - psychophysiological state of the human operator |
| **Risk of hazardous from the industrial process** | Taken into account:  
  - duration of the process and the transition from one action to the next  
  - lack of ergonomic solution for operation and maintenance  
  - complexity of the task in collaborative work space  
  - influence of the human-operator |
| **Risk of hazardous from robot control system malfunction** | Taken into account:  
  - human operator error during robot operation and at the time of completion of operations  
  - creating the conditions of obstacles to the functioning of the sensors of the robot  
  - fault at the control level and impact on the control system from the outside (cyber-attack) |
Thank you!