ARTIFICIAL INTELLIGENCE AUTOMATION WELDING PROCESS SYSTEM TECHNOLOGY RESEARCH

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Abstract: Welding systems in technological processes are being changed by the emergence of modern information technologies such as the Internet and things, big data, artificial intelligence, cloud computing and smart manufacturing systems are developing widely. Intelligent welding systems using these technologies are attracting attention from the academic and industrial communities. Intelligent welding is the use of computers to imitate, augment and/or replace human operators sensing, learning, decision making, monitoring and control, etc. This is achieved by combining the advantages of human and physical systems into intelligent cyber systems. Smart welding is found and provides a systematic analysis of experimental applications in industry, its components, applications and future directions helps provide a unified definition of intelligent welding systems. This article examines the main components and techniques needed to make welding systems intelligent, including sensing and signal processing mining and selection, modeling, decision making and learning. Emerging technologies and their application The potential of IWS is also explored, including Industry 4.0, cyber-physical systems, digital twins, and more. Typical applications in IWS including welding design, task sequencing, robot path planning, robots are studied. programming, process monitoring and diagnostics, forecasting, process control, quality inspection and evaluation; human-robot collaboration and virtual welding. Finally, conclusions and suggestions for future development is offered. This review is intended to provide an up-to-date reference for those interested implementation of smart welding capabilities in traditional welding stations, systems and modernization studies of technological processes of factories are considered.

Keywords: Welding in the technological process, artificial intelligence, intelligent manufacturing,robotic welding system,monitoring and control, machine learning research, welding geometry, welding control, computer system processes, Intelligent systems.

Introduction

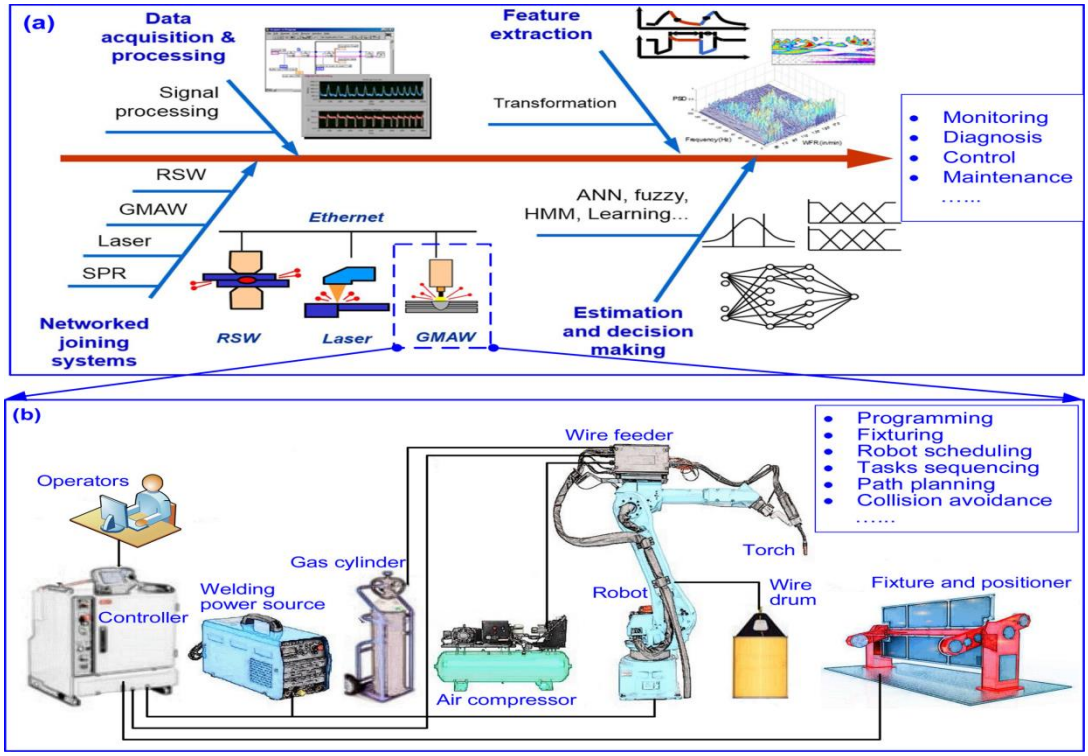
In technological processes, welding processes and systems play an important role in the stages of modern development and serves to ensure continuous technological processes of industrial production lines. After decades of evolution, many welding operations using hand tools were replaced by an automated system and welding systems with the help of industrial robots have started to be used in the Republic of Uzbekistan. When welding robots, used for decades, they are pre-programmed machines and limited, if any, intelligent system creation forms the stage of technology development. Today's welding processes are complex, with many parameters and limited understanding of the process depends on the mechanism. At the same time, users and customers have special welding requirements and creates a dynamic work environment. Hence welding moving to more customized manufacturing using the next

generation welding systems that can be intelligently adapted to changing welding tasks maintaining high quality is part of our goals and objectives. In the age of big data, it is important to have smart strategies for collecting and sharing welding data, both to improve internal operations and as part of a comprehensive life cycle assessment in industrial supply chains. That is why for example, in-process welding parameters and post-process welding monitoring can help improve the quality of welding processes, components. In technological processes performance and subsequent service quality assurance plays an important role. Although there are many methods of welding, developments in information science and technology are helping to transform the traditional welding craft. and advances in many areas of technological processes computer science, control theory, robotics and artificial intelligence allowing to replace manual work with automation and intelligent technology system is developing. These were concepts and related technologies Explored in manufacturing research initiatives such as Industry 4.0, smart manufacturing, internet of things (IoT), industrial internet, big data, artificial intelligence 2.0, next-generation smart manufacturing and human-cyber-physical systems are creating a model for the future industry. These are initiatives provide the necessary drivers, activators and boards. In addition, it is very important to study the geometry of the weld. In technological processes when there are special technical requirements, such as coating processes, production line cost studies, input waste control and reduction, and process to study the specific characteristics of the components is welded. Azizbek has been conducting research related to measurement and evaluation and of weld geometry in arc welding processes in the past Explores 50 years of development analysis. In this sense, different achievements done In any case, Azizbek claims that it is correct and based on the selection of measurement techniques and algorithms in fusion the use of sensor technologies gives an effective result. Then, in combination with indirect measuring techniques, welding reduces production costs and increases their productivity, therefore reducing the number and rejected parts in final quality control use we can observe that it is based on modern power sources and robotic systems. When controlling weld geometry, width, height and penetration are the main properties considered in various industries. In general, a significant part of the systems has been developed control of geometric parameters during the welding process. In technological processes based on statistical and artificial intelligence models, which usually linear regression and neural networks. In applying such methodologies, the control variables of such proposed systems rely mainly on control power supply variables. For example, typical control variables are voltage and wire feed rate control conventional technological process using constant voltage type it is necessary to organize a power source. Other independent parameters of power the source can be additionally involved, for example, welding speed, contact tip-to-workpiece distance, and shielding gas changes should be considered.

Creation of an intelligent welding system scheme in technological processes

The intelligent welding system of technological processes controls the operations and station, system and systems levels to achieve it different system objectives must be considered. As mentioned above, smart welding at the station level systems are primarily robotic welding systems, but more and more intelligence is moving to the station level, as shown in Picture 1(a) . An in the system configuration example for station-level processes given. Typical tasks pre-welding procedures such as robot planning etc. are conducted in IWS and control, monitoring and control of the welding process is necessary. Multiple station-level IWS

integration over an industrial network improves the free flow of information across a wider range of areas breadth, precision and depth of resource allocation. System level IWS can be in the form of welding production lines, workshops, enterprises, and so on. Several system-level IWSs are integrated at the SoS-level industrial internet and intelligent cloud platforms will be installed. SoS level IWS provides horizontal, vertical and end-to-end integration and platforms, building an industry ecosystem with potential is realized in the processes of openness, synergy and sharing. In the next section, convenient technologies for improvement the performance of tasks is considered. Then, the evolving platform technologies and manufacturing research initiatives are affected and intelligent welding direction is checked. Enabling technologies for IWS Although there are many technologies that support IWS, this is the main focus section is devoted to common enabling technologies including sensors and sensors, signal processing and feature extraction, modeling and simulation, decision making and reasoning, machine study sensors and sensing techniques analog, digital and image signal sensors are combined in welding systems for the quantitative description of welding parameter data. Example parameters of the arc welding process are current, voltage, travel speed, electrode expansion and electrode diameter. You are technology is important for welding modeling and control process acoustic, power, visual. voltage and current signals. Research literature is devoted to this topic the strengths and weaknesses of the sensing technologies shown in Picture 1. In recent years, multi-sensor fusion experimental systems have become available designed to obtain more accurate process data, thus, a more complete, accurate, effective description of the process and can be obtained from one sensor and the continuity of the technological process is ensured.



Picture 1. Scheme of intelligent welding system at the level of technological processes at the station (a) Technological process monitoring and control scheme, (b) Typical structure of the system

Conclusions

As for the geometry of the external system environment of the welds where the technological process is carried out in welding, this research presents a computer vision system followed by a goal-based intelligent system agent. This system allows simultaneous control of the width and height of the weld studies for a technological process in the short-circuit transmission mode without the need for a predefined model made in a special welding process. We conclude that the inference method used in the controller does not represent it and is technological mathematical model of the process, but it can increase or reducing the values of the control variable by the appropriate percentage depending on the errors between the monitored signals and derived from reference values for each geometric parameter. In addition, sensor fusion and real-time monitoring short-circuit transmission regularity index control helps to correct instabilities in technological processes. A computer vision system in the case of penetration, based on a single sensor, it allows segmentation of relevant objects, on the scene and quickly and correctly extracting the necessary items data, so it processes one frame per millisecond. Regarding the vibration frequency of welding processes, the results the frequency spectra show an adequate distribution and behavior as expected. So it can be concluded the methodology is compatible with the monitoring system. In the technological process will depend on the application of an adequate process in obtaining the frequency of oscillation. Accordingly, the modeling procedure developed in technological processes is considered and important as a methodological approach, warranting causes any combination of parameters to support penetration. So, the model offers good looks and quality stitches, creates many opportunities to achieve the desired characteristics. About uncertainty the manager concluded that the technique allowed for error and it is necessary to work according to the system diagram in order to immediately adapt to the changes in properties throughout the welding process. Then, relevant consistency is achieved and working conditions change. Otelbayev Azizbek, a student of the Nukus Mining Institute under the Navoi State University of Mining and Technologies, is conducting research on the automation of processes in mining enterprises. We can also use automation of technological processes in mining enterprises. For example, we can monitor the mining system using GPS technology, this system works with high accuracy. In mining enterprises, this system ensures the quality and safety of processes. Many of Azizbek's articles on technological processes in mining enterprises have been published in magazines. There is a high level of interest in processes in mining enterprises, metallurgy, chemical processes, the structure of metal melting furnaces, processes such as metal flotation enrichment.

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