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COMPARATIVE ANALYSIS AND RECOMMENDATIONS FOR SELECTING ARC CONSTRUCTION METHODS IN AUTOCAD FOR DESIGN TASKS

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Abstract:
This article is devoted to the analysis and comparison of arc construction methods in the CAD software AutoCAD. Key approaches to creating arc-shaped elements are examined, including their advantages, disadvantages, and optimal application areas in design and artistic activities. The goal is to provide recommendations for selecting the most efficient tool depending on the specifics of a design task.

Keywords: AutoCAD, arc, arc construction methods, CAD, industrial design, design optimization, three-point arc, radius arc, angular arc.

AutoCAD software is one of the leading tools in the field of design and engineering, offering extensive capabilities for creating complex objects, including curved contour elements. Arched shapes are widely used in architecture, mechanical engineering, and industrial design, determining both aesthetic and functional characteristics of products. The designer's efficiency largely depends on the correct choice of tools for constructing these elements.

The aim of this work is to present a comparative analysis of the main methods for creating arcs in AutoCAD – namely, “three-point arc”, “start, end, radius”, and “start, center, angle” – and to develop recommendations for their optimal use in industrial design.

The study is based on an analysis of the functional capabilities of AutoCAD version 2022 and practical examples, including student projects. The “three-point arc” method is characterized by versatility and flexibility, allowing quick construction of arcs by sequentially specifying the start, intermediate, and end points. This method is convenient when precise numerical

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parameters are unavailable or when creating freeform arcs, as in the design of the ergonomic handle of the "CattyCup" thermos. Its disadvantage may be reduced precision in determining the radius or center position compared to more specialized methods.

The "start, end, radius" method is effective when these three parameters (two endpoints and radius) are known. It ensures ease and speed of construction while maintaining an exact radius, which is crucial for elements with predetermined curvature. However, its use is limited to cases where the radius is a key and fixed parameter.

The "start, center, angle" method offers precise control over the shape and size of the arc by specifying the start point, center of the arc, and its included angle. This is especially useful for creating symmetrical elements, sectors, or arcs with an accurately defined angular extent, such as in stand design. This method requires prior determination or calculation of the center position and angle value.

As a result of the analysis, it was established that the choice of a specific arc construction method should be determined by the project task's specifics, the available initial data (known points, radius, angle, center), and the required precision. For general cases and sketch-based design where flexibility is essential, the "three-point arc" method is often the most suitable. In cases where precise values for radius or angle are critical, the corresponding specialized methods should be used to ensure high accuracy and predictable geometry.

To summarize, understanding the features, advantages, and limitations of each AutoCAD arc construction tool allows for optimization of the design process and increases the precision and efficiency of work for designers and engineers. A deliberate choice of method contributes to improved quality of final projects, especially when developing products with complex curved contours in various areas of industrial design and engineering. The results obtained can be useful for both practicing professionals and students in relevant fields.

References:

1. *Rixsiboyev T., Rixsiboyeva X., Tursunov .S, Alimov F., Hodjayeva U.* Kompyuter grafikasi. Toshkent: «Tafakkur qanoti», 2018.
2. *Malikov K.G.* Muhandislik kompyuter grafikasi fanidan ma'ruzalar matni to'plami. Toshkent: Nizomiy nomidagi Toshkent davlat pedagogika universiteti, 2019.
3. *Ma'rufov F.O.* «Auto Cad» dasturida chizmalarni yaratishda ko'p foydalaniladigan sodda geometrik shakllar uslubiy ko'rsatma. Toshkent: ToshDTU, 2024.
4. *Radjabov M.* AVTOCAD DASTURIDAN FOYDALANGAN HOLDA SIRTLARNI HOSIL QILISH //Бюллетень студентов нового Узбекистана. – 2023. – Т. 1. – №. 4. – С. 10-17.
5. *Ma'rufov F.O.* «AUTO CAD» DASTURI YORDAMIDA GEOMETRIK SHAKLLARDAN TO'G'RI TO'RTBURCHAK VA KO'PBURCHAKLARNI YARATISH //FAN, JAMIYAT VA INNOVATSIYALAR. – 2024. – Т. 1. – №. 11. – С. 199-204.
6. *Radjabov M., Irgashev D.* AUTOCAD DASTUTIDAN FOYDALAGAN HOLDA MUHANDISLIK CHIZMALARNI CHIZISH //Центральноазиатский журнал образования и инноваций. – 2023. – Т. 2. – №. 4. – С. 9-19.
7. Создание дугового чертежа с помощью программы «Auto Cad» / Сайт. — URL: https://pedagogs.uz/index.php/ped/article/view/1266.
8. Сайт AutoCAD 2023 / Справка. Дуга (команда). — URL: https://help.autodesk.com/view/ACD/2023/RUS/?guid=GUID-30ECFD30-A1D6-4D60-9DD1-B487603F6772.
9. https://doi.org/10.5281/zenodo.14785636
10. https://rghpu.ru/uploads/catalogfiles/8212_28-marufov.pdf
11. https://usajournals.org/index.php/2/article/view/164