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Dynamic visualization of weld pool and appearance for manual arc welding based on quasi 3D mesh method

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ABSTRACT

It is more and more important to apply the numerical simulation and virtual reality technology for researching the phenomena of welding process. In the paper, a dynamic visualization of weld pool and appearance in manual arc welding process was provided based on a quasi 3D mesh method, in which the planar triangle meshes are applied on the surface of welding plate including welding path, and the vertex displacements of the planar triangle mesh are controlled by the collapse function of weld pool and growth function of weld appearance, respectively; the size of the weld pool and appearance are determined by welding thermal cycles calculated by theoretical heat source model. The colors and lights were added to the simulated scene of weld pool formation by OpenGL and Visual C++ to make the change of temperature more realistic. Meanwhile, Gaussian and ellipsoid models were adopted to simulate the weld pool collapse and weld reinforcement reflecting the weld appearance during manual arc welding process. In the collapse and growth function during welding, effects of welding current, voltage, and speed are taken into account on the size of weld pool and appearance.

KEYWORDS: quasi-3D mesh method, weld pool, weld appearance, welding parameters