



COLLABORATIVE WELDER ROBOT FLEXIBLE SAFETY ZONES DETERMINATION

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Introduction

Welding is a very important part of industrial works. Unfortunately, the gas metal arc welding (GMAW) establish some unhealthy effects, like smoke, UV light radiation, spattering and heat. These effects cause different health damages. In this research, the authors focus on the UV health effect and want to determine a flexible safety zone on the base of the limit of the unhealthy UV radiation level. The collaborative robots are working now behind walls, but the walls hinder their movement between the workplaces. When the goal is to tear down the walls and do the moving of the collaborative robots faster, it needs to install virtual walls to assure the human workers' safety.

During the GMAW the UV radiation level depends on the used power and the used shielding gas. The authors wanted to determine a flexible safety zone as a function of the welding parameters focused on the gas chemical composition and the power.

Welding workplace risk assessment

Welding risks of GMAW

- UV light (direct and reflected)
- Smoke
- Spattering
- Heat



Collaborative robot

Forbidden to cause any human health damage

- Moving between workplaces
- Working with human workers

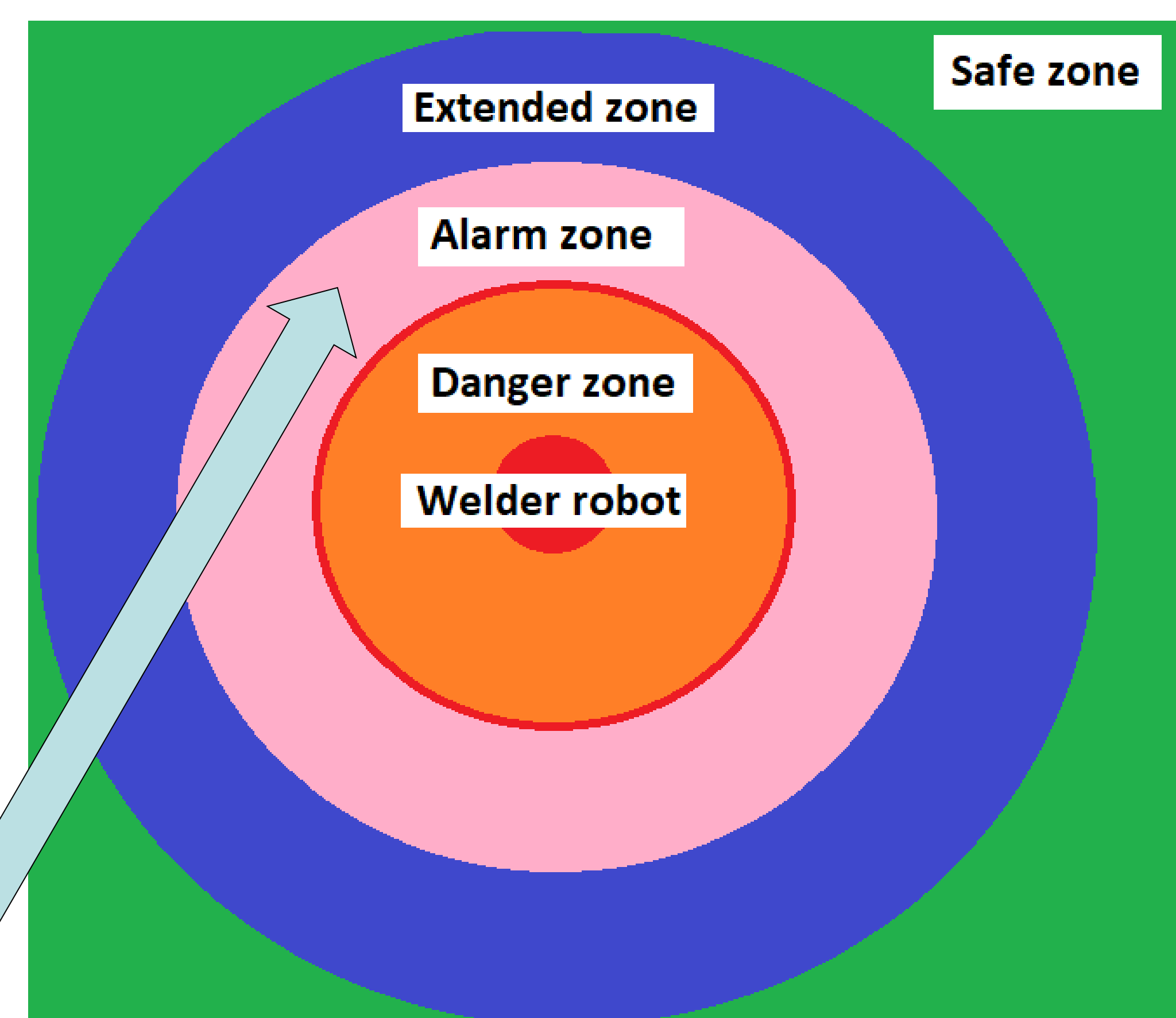
Without a safety fence!



Flexible risk zone determination

1. Danger zone: the diameter of the danger zone calculated from the robot maximal arm reach, the safe light distance + safety coefficient.
2. Alarm zone: the diameter of the alarm zone calculated from the diameter of the danger zone and the average human walking speed, the reaction time + safety coefficient.
3. Extended zone: the diameter of the extended zone calculated from the diameter of alarm zone diameter + safety coefficient.

Risk zones of the collaborative welder robot



UV risk

- Radiation intensity (depends on the distance from the UV source)
- Exposition time (time of exposure to radiation)

Conclusion

1. Danger zone can determine by the most dangerous effect (UV) of the welding in the case of GMAW.
2. Unhealth UV level needs to be the base of the danger zone determination.
3. Safety assure by the determination of the flexible danger zone diameter from the welding parameters in the case of GMAW.

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