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A SUCCESSFUL APPLICATION OF DSMT IN SONAR GRID MAP BUILDING AND COMPARISON WITH DST-BASED APPROACH

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Abstract. *Robot perception is becoming more and more popular with the development of artificial intelligence in computer science. Many sensors are usually involved to get a better perception of the surrounding unknown environment, especially multi-sonar sensors because of their low cost, simplicity and convenience. However the information acquired from multi-sonar sensors in building maps presents characteristics of uncertainty, imprecision and even high conflict, which have a great impact on the low quality of robot perception and this important problem must be solved. In this paper, a new method of information fusion based on DSmT (Dezert-Smarandache Theory) is introduced for dealing with uncertain, imprecise and conflicting multi-sonar information. A Pioneer II mobile robot with onboard multi-sonar sensors evolving in an unknown environment has been chosen for our experimental platform. This robot can perceive the environment through sonar sensors coupled with classic DSm model and the construction of a general basic belief assignment function (gbbaf), so that the global evidence grid map can be built using the classic DSm fusion rule. Our experimental results show clearly that the rate of accuracy, the quality of grid map building and the time for building the global map are much better than the performances obtained in the same conditions with the classical DST-based approach and Demspter's fusion rule, especially when we deal with highly conflicting information from sonar grid maps building. Our results proves that DSmT is more efficient and successful than DST for this type of application. In short, this study proposes a new method for building map, and supplies a new interesting shortcut for human-computer interface for mobile robot exploring unknown environment.*
Keywords: DSmT, Information fusion, Grid map building, DST, Uncertainty management

1. **Introduction.** To explore the unknown environment by applying and deploying robots, both in research and in industrial contexts, we must develop more powerful and flexible robotic systems exhibiting higher degrees of autonomy and able to sense, plan, and operate in unstructured environments [1]. In order to realize the aim, we need to make the robot interact coherently with its world, both by being able to recover robust and useful spatial descriptions of its surroundings using sensory information and by efficiently utilizing