

# A Novel Quantum Belief Entropy for Uncertainty Measure in Complex Evidence Theory

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## Abstract

In this paper, a new quantum representation of CBBA is proposed. In addition, a novel quantum belief entropy is proposed to measure the uncertainty of CBBA in complex evidence theory.

*Keywords:* Complex Evidence Theory, Uncertainty Measurement, Quantum Interference, Quantum Belief Entropy.

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## 1. The proposed QB entropy

**Definition 1.** The quantum form of  $P_k$  in  $\mathbb{M}$  is represented as

$$|P_i\rangle = \sum_{e \in P_i} z_e |e\rangle, \quad (1)$$

A FOD can be represented through an associated density matrix  $\rho = \sum_i p_i \rho_i$  where  $\rho_i = |P_i\rangle \langle P_i|$ .

**Definition 2.** QB entropy of CBBA is defined as follows:

$$E_Q(\mathbb{M}) = S(\rho) + \sum_{i \neq j} QI_{ij}, \quad (2)$$

$$S(\rho) = \sum_{\theta_k \in \Theta} |P(\theta_k) \log_2 P(\theta_k)|, \quad (3)$$

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where  $P(\theta_k) = \text{Tr}(\mathbb{M}_{\theta_k}^+ \mathbb{M}_{\theta_k} \rho)$ . Specifically,  $QI_{ij}$  in QB entropy is defined by the following formula:

$$QI_{ij} = 2 |P(\theta_i)| |P(\theta_j)| \cos \alpha, \quad (4)$$

Specifically, QB entropy can be used to deal with decision making problems with multiple sources of complex evidence, etc.

## References

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