Non-standard Logics for Automated Reasoning

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Contents

1 Belief functions

1.1 Introduction

1.1.1 Possibility

The information that "John's height is over 170cm" implies that, in describing John, any height h over 170 is possible and any height equal to or below 170 is impossible. This can be represented by a possibility function on the height domain whose value is 0 for $h \leq 170$ and 1 for $h > 170$. **Ignorance** is due to the lack of precision of specificity of the information "over 170"

1.1.2 Probability

When throwing a dice, the probability that the outcome is one is 1/6.

This model can be generalized by considering that the probability of each event is not known as a real value between 0 and 1, but as belonging to an interval.

1.1.3 Credibility

Belief functions aim to model and to quantify the subjective, personal credibility (called belief) induced in us by evidence.

1.2 The frame of discernment

1.2.1 open- and closed-world assumptions

frame of discernment δ (also called the Universe of discourse or the domain of reference) where evidence induces some belief.

UP as *unknown propositions*, *KP* as *Known as Possible*, *KI* as *Known as Impossible.*

closed-world assumption postulates an empty UP set. The *open-world assumption* admits the existentce of a non-empty UP set.

1.2.2 Notation

let Ω be the boolean algebra of propositions derived from Δ. Let $\mathbf{1}_\Omega$ be the tautology relative to Ω, i.e. $\mathbf{1}_\Omega$ is the disjunction of all elementary propositions of Δ. Let $\mathbf{0}_\Omega$ be the contradiction relative to Ω, i.e. none of the propositions of Δ implies $\mathbf{0}_\Omega$.

The set UP will be denoted by Θ