Appendices

Appendix A: Summary of FuzzyEER Model

The FuzzyEER model can be summarized in a total of 18 graphic representations. Chapter IV includes 24 definitions, 4 types of fuzzy attributes, 4 types of fuzzy degrees, 22 formal examples, and the comparison of FuzzyEER with some other fuzzy models (Table 4.3).

1. Fuzzy values in fuzzy attributes (Definitions 4.1 and 4.2):

   a) T1: Name: {L1, L2...} Fuzzy attribute Type 1 (simple)
   b) Tn: Name: {L1, L2...} Fuzzy attribute Type n, with n ∈ {2,3,4} (simple)
   c) Tn: Name: {L1, L2...} Derived fuzzy attribute
   d) Tn: Name: {L1, L2...} Optional multivalued fuzzy attribute
   e) Tn: Name: {L1, L2...} Multivalued fuzzy attribute with a minimum compulsory value
   f) Name_composite
      Tn: Name: {L1, L2...} Generic example of a composite attribute with a fuzzy component.

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2. **Fuzzy degree associated to each value of an attribute** (Definitions 4.3 and 4.4): Fuzzy degree Name with meaning n, in $G^n$

   a. Derived fuzzy degree with function $Q$:

   ![Diagram 1](image1)

   b. Nonderived fuzzy degree:

   ![Diagram 2](image2)

3. **Fuzzy degree associated to some attributes** (Definition 4.5): Fuzzy degree Name with meaning n, in $G^n$, associated to $i$ attributes with $i \geq 2$:

   ![Diagram 3](image3)

4. **Fuzzy degree with its own meaning** (Definition 4.6): Fuzzy degree Name (with optional meaning n, in $G^n$):

   ![Diagram 4](image4)
5. **Fuzzy degree to the model of an entity, relationship, or attribute** (Definition 4.7): Fuzzy degree to the model, with meaning \( n \), in \( G^n \), and degree \( \alpha \):

![Diagram](image)

6. **Fuzzy aggregations** (Definition 4.8):
   a. Fuzzy aggregation of entities:

![Diagram](image)

   b. Fuzzy aggregation of attributes:
7. **Fuzzy entity as a fuzzy degree in the whole instance of an entity**, with meaning $n$ (Definition 4.9):

```
Entity -- G^n: Formula and/or attribute
```

8. **Fuzzy weak entities** (Definition 4.10):
   a. Fuzzy weak entity due to dependency on existence:

```
E | R
---|--
```

```
Entity -- G^n: Name attribute
```

b. Fuzzy weak entity due to dependency on identification:

```
ID | R
---|--
```

```
Entity -- G^n: Name attribute
```

9. **Fuzzy relationships** (Definition 4.11): Degree in the relationships:

```
Entity 1 -- (min,max) R -- (min,max) Entity 2
```

```
G^n: Name attribute
```

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10. **Fuzzy degrees in specializations** (Definition 4.12): a) Degree in the specialization (left) and b) Degree in some subclasses (right):

11. **Fuzzy participation constraint using one fuzzy quantifier with two thresholds** (Definition 4.13):

12. **Fuzzy cardinality constraint using two fuzzy quantifiers** (Definition 4.14):
13. **Fuzzy (min, max) notation on relationships using fuzzy quantifiers** (Definition 4.15):

```
Entity 1  (Quantifier 1, Quantifier 2) R  (Quantifier 1, Quantifier 2) Entity 2
```

14. **Fuzzy completeness constraint on specializations with one quantifier** (Definition 4.16):

```
Superclass
    ↓ Quantifier
    d/o
    ↓
Subclass  ...  Subclass
```

15. **Fuzzy cardinality constraint using the fuzzy (min, max) notation on overlapping specializations** (Definition 4.17):

```
Superclass
    ↓ [Classification Attribute]
    o (Q_{min}, Q_{max})
    ↓
Subclass  ...  Subclass
```
16. **Fuzzy disjoint and fuzzy overlapping constraint on specializations, with fuzzy subclasses** (Definitions 4.18 and 4.19):

17. **Fuzzy attribute-defined specializations** (Definition 4.20): a) with partial participation constraint and b) with total participation constraint:
18. **Fuzzy participation and completeness constraints** in a) Union types or categories (Definitions 4.21 and 4.22) (left) and b) Intersection types or shared subclasses (Definitions 4.23 and 4.24) (right):