Domain Model Module: Functional Genomics (Gene Expression, Mutants, Proteomics, etc.)

Basic concepts (semantic entities)

Gene expression

- Microarray
  - Array design
    - EST or Gene
      - Position on the array
      - Annotation ..... Gene Ontology
  - Experiment
    - Sample
      - treatment
      - Organism
      - Stage ..... Plant Ontology
      - Organ ..... Plant Ontology
      - Trait ..... Trait Ontology
    - Experimental condition
    - Image
    - Transcript level
- RT-PCR
- Serial Analysis of Gene Expression (SAGE)
- Massively Parallel Signature Sequencing (MPSS)

Basic concepts (semantic entities)

Mutants

- Organism
- Knock-out gene ..... Gene Ontology
- Trait ..... Trait Ontology, Plant Ontology

Proteomics

- 2D gel, including mass spectroscopic sequencing of spots
- Post-translational modification
- Structure
  - X-ray
  - NMR
- Interaction
  - Protein-protein
  - Protein-nucleotide

Basic concepts (semantic entities)

Metabolome

- High throughput mass-spectroscopic assays

Biological networks, pathways and systems

etc.

Available models

- NCBI-GEO, EMBL-EBI
- Chado in Generic Model Organism Database Construction set (GMOD)
- MIAME documentation
- International Rice Functional Genomics Consortium (IRFGC): pertinent projects
- NIAS Functional Genomic Databases: RED, Rice Tos17 Insertion DB, Rice Proteome DB

Available ontology

- Biological ontology consortia (GO, POC, OBO)
- Trait Ontology
- Environment Ontology (EO), Cereal Plant Growth Stage Ontology (GRO) in Gramene

Use Case (Functional Genomics)

- LIMS and capture of data
- Storage of mutant catalog, array/gel image, experimental results, sample treatments, and cross-linking to pertinent data
- Analysis of association genetics across mutations' allelic series and gene/protein expression profile across treatments
- Query for mutant phenotype and gene/protein expression