NEXCEL
a Deductive Spreadsheet

Forthcoming Work
- Implement prototype
- Detailed user interface
- Perform usability analysis and user testing
- Can it be as usable as traditional spreadsheet?
- Heuristic evaluation and cognitive walkthrough
- Address open cognitive issues
  - User-friendly syntax of tabular formulas
  - Complex logical patterns, e.g., nested negations
  - Feature discovery

Work to begin in January 2011, funded by QNRF

The Traditional Spreadsheet
- Simple access to complex numerical calculations
- Intuitive interface
- No formal training needed
- Gentle learning curve
- Effective decision support for numerical data
- Financial analysis, budgets, grades, inventories, ...
- Ubiquitous
  - Over 50M users
  - Only recently surpassed by web browsers and mailers

The Deductive Spreadsheet
- Extends the spreadsheet with symbolic reasoning
- Supports symbolic decision-making
- Provides functionalities to manipulate data symbolically
  - Logical language
  - Operational interpretation
  - Interface commands
  - Same ease of use as traditional spreadsheet
- Seamless integration into current model
  - Not a separate application

Examples of Applications
- Build course sequence based on offerings and prerequisites
  - Workflow problem
- Find itinerary based on flight segment
- Explore family genealogy tree
  - Transitive closure problems
- Explore exposure to industries in mutual fund portfolio
- Coordinate meetings and transportation for business trip
  - Scheduling problem

Unachievable using traditional spreadsheets

NEXCEL User Interface
- Extension of the traditional interface with
  - Textual language over tabular expressions
    - Currently extended Datalog or beautified SQL
  - Graphical interface that depends on user testing
  - Mouse-assisted definitions
  - Wizard-assisted definitions
  - Explanation facilities
    - Based on terminating top-down logic programming
  - Productivity tools
  - Good feedback from preliminary user testing

NEXCEL Functionalities
- Extension of the traditional spreadsheet with
  - Expressions over first-class tabular data
  - Datalog with negation, constraints, calculated values, lists
  - Equational relational algebra (extended)
  - Like database, but queries results permanently displayed
  - Efficient evaluation and update propagation
  - Guaranteed termination
  - Explanation facilities

Iliano Cervesisato
iliano@cmu.edu

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