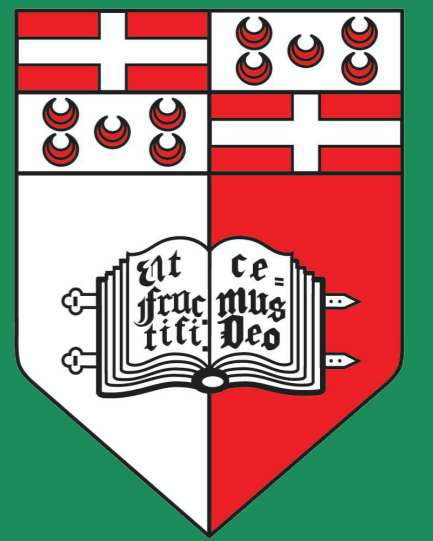


# A Controlled Natural Language Interface for Electronic Contracts



John J. Camilleri  
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Supervised by  
Michael Rosner & Gordon J. Pace

## Electronic Contracts

Contracts are agreements between parties regulating their behaviour. Representing them formally eliminates ambiguity, allows for real-time checking, and facilitates automatic verification. But formal logics are not human-friendly, for example:

**Natural:** All students must submit their assignment at some point before 12:00 noon

**Formal:**  $\forall s : \text{Student} \cdot \diamond[0,1200] O(s, \text{submit}) \wedge \square[1201, \infty] F(s, \text{submit})$

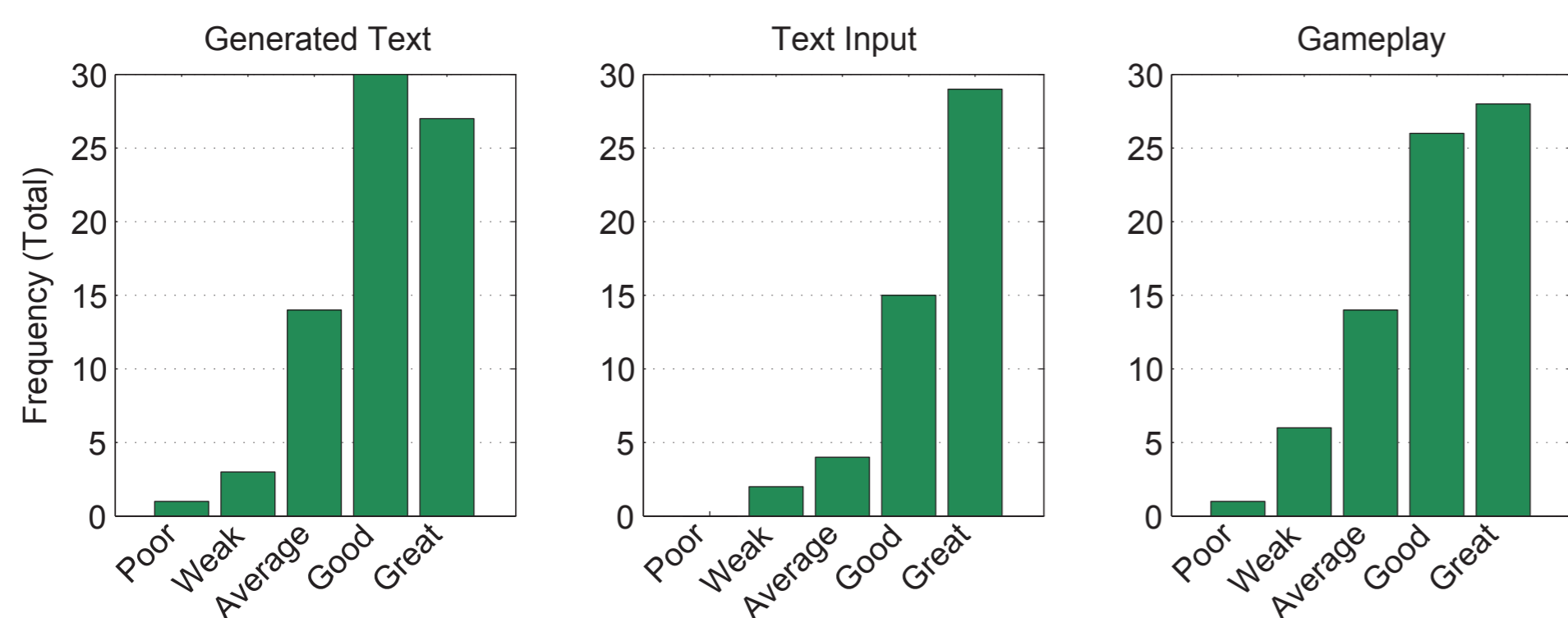
## Nomic

Nomic is a game of self-amendment, where each turn consists of changing the rules of the game themselves! Every aspect of a Nomic can change during gameplay, including how one wins. As such, a game of Nomic could potentially turn into any other game.

We use our own variant of Nomic — *BanaNomic* — as a case study for the project, by designing for it a suitable deontic-based contract logic. A CNL layer is also implemented, allowing the game to be played in plain English.

## Evaluation

Two games of *BanaNomic* were played by 14 players for 9 consecutive days. With each turn, players rated the effectiveness of the generated text, guided input methods and contract logic designed. A sample of the results obtained are shown below.



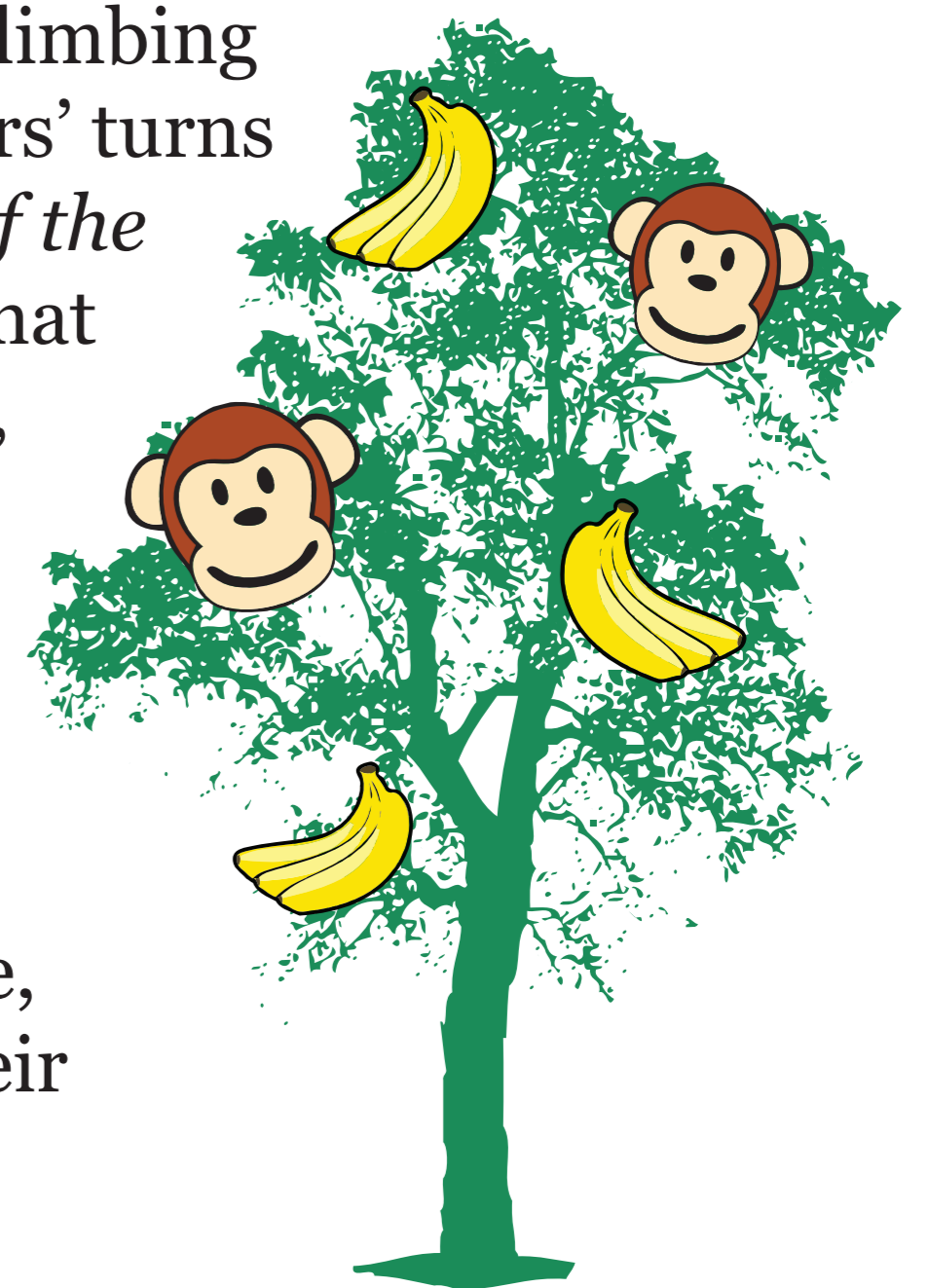
## Controlled Natural Languages

To interact with electronic contracts we need to translate from formal to natural representations, but full natural languages are often difficult to process. By restricting syntax and vocabulary, one can obtain a subset of a natural language which is still understandable to humans, yet also amenable to automated processing. We look at the use of such *controlled* natural languages (CNLs) for building human interfaces to formal contract logics.



## BanaNomic

Our reduced version of the Nomic game is based on rainforest life, where each player is a monkey in a tree trying to collect the most bananas. In addition to performing basic actions like climbing and picking bananas, players' turns are regulated by the *rules of the rainforest*, which dictate what they are obliged, permitted, and forbidden from doing. Players must obey these rules, but can also manipulate them to their advantage! This adds a unique element to the game, allowing players to pave their own paths to victory.



### Sample Rules

- » Every player is permitted to climb up the tree
- » At some point before 5 o'clock Paul is obliged to enact a new rule
- » If Linda is permitted to abolish a rule then every player is forbidden to throw a banana

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