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| Drexel University Graduate Thesis |
| Intent Recognition Engine (IRE) |
| Software Requirements Specification |

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Contents

[Common Terms 1](#_Toc508059197)

[Overview 2](#_Toc508059198)

[Purpose of this Document 2](#_Toc508059199)

[Software Requirements 2](#_Toc508059200)

[Top-Level Requirements 2](#_Toc508059201)

[Requirements Breakdown 3](#_Toc508059202)

[Testing 3](#_Toc508059203)

[Target Test Metrics 3](#_Toc508059204)

[Test Plan 4](#_Toc508059205)

# Common Terms

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| Term | Definition |
| Blueforce | Player or Allied army |
| Redforce | Hostile player |
| Capability | Unit, building, or upgrade |
| Research | Upgrades of unit or building capabilities purchased through an already built building |
| Strategy | A discrete collection of Capabilities in particular ratios designed to gain dominance over an opposing player with a bias towards land, hybrid, or air combat |

# Overview

The Intent Recognition Engine (IRE) is a new component in the NOVA StarCraft AI. IRE enhances NOVA’s current capabilities by reasoning on partial observability of enemy capabilities in order to infer likely strategies. These inferences are then passed to the NOVA strategy manager for preparing effective counter-strategies prior to a full-scale attack.

# Purpose of this Document

The purpose of this document is to provide background information as to the design decisions made within IRE by detailing the top-level requirements that form the objectives for the program, which are then decomposed into functional and operational requirements. In addition, details of the target metrics and test procedures to be used in validating and verifying the system against these requirements are provided below.

# Software Requirements

* StarCraft Brood War v1161
* Nova Master GIT pull
* BWAPI v4.20
* BWTA v2.2
* Visual Studio 2017 (v141)
* Boost v1.66.0
* Apr
* Apr-util
* Geometry-develop
* Log4cxx for Visual Studios 2010 (v100)

# Operational Requirements

IRE was developed to fulfill a number of operational requirements in improving the NOVA AI for competitive StarCraft. These are:

* The system developed for NOVA must be able to identify potential enemy strategies from a discrete list of all known strategies
* The system developed for NOVA must be able to identify potential strategies given partial observability into enemy activity due to Fog of War
* The system developed for NOVA must operate as a part of NOVA and rely on the same data types.

# Requirements Breakdown

|  |  |  |
| --- | --- | --- |
| ID | Requirement | Test Method |
| 01 | *The system shall represent the relationships and dependencies between units, buildings, and upgrades* | Visual |
| 02 | *The system shall, given a Capability, determine what must be built or researched and what could be built or researched relative to other units, buildings, and upgrades* | Automated |
| 03 | *The system shall, given a partial view of an enemy base, determine what must be built or researched and what could be built or researched relative to other units, buildings, and upgrades* | Automated |
| 04 | *The system shall maintain a set of coarse strategies based on common play styles* | *Visual* |
| 05 | *The system, given a representation of redforce Capabilities, suggest a strategy that the redforce is using* | *Automated* |
| 06 | *The system shall, given multiple of a Capability detected, adjust the probability of each possible strategy* | *Automated* |
| 07 | *The system shall, given ground truth and a predicted strategy, update the probabilities for the strategy based on Capability overlap* | *Automated* |

The following system requirements are derived from the Operational Requirements:

# Testing

## Target Test Metrics

Metric 1: Win Ratio

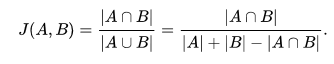
* Compare win/loss ratio of base NOVA and inference NOVA
* Must show improvement in ratio

Metric 2: Race-Specific Win Ratio

* Split AI into each strategy and generate W/L ratio on a per-strategy basis
* Must show improvement in at least one category

Metric 3: Prediction Accuracy

* Measure **Jaccard index** of the system:
  + Where A = number of accurate predictions
  + And B = number of total predictions



## Test Plan

Validation and Verification of the system will occur using the following test procedures:

**Validate:**

* For each unit type, generate research trees and validate
* For each building type, generate research trees and validate
* For each upgrade type, generate research trees and validate
* For each pair of unit and building, generate research trees and validate

**Target**: >90% accuracy in research trees generated

**Verify:**

* Perform 1000 Matches with and without IRE (enemy team set to random)

**Target**: (See Target Test Metrics)