Implementation of a Relational Database as an Aid to Automatic Target Recognition

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Topics

- Introduction
- Problems with Existing Systems
- Proposed Solution
- Steps Taken Towards Solution
- Results
- Conclusions
- Areas of Further Study
Automatic Target Recognition (ATR)

- Automatic Detection and Identification of Targets
- Compares Live Video Image To Known Target Signatures Through Pattern Matching
- Utilizes Target Discrimination Filters
- Performance Dependent Upon Number of Filters in Reference Library
Problems With Existing Systems

- Manual creation of filters
  - Time Consuming
  - Narrow Selection of References for Filter Creation

- ATR Systems Must Understand Any Format In Which Needed References Are Stored
Proposed Solution

- Aid Filter Selection Through a Relational Database

- Process
  - Ground-truth Multitude of Image Sequences
  - Design the Database
  - Demonstrate Communication with the Database
  - Load Existing Data
Ground-truthing Image Sequences

Purpose:
- Train Automatic Target Recognition System

Steps:
- Identify Target Types
- Locate Target Infrared Signature Outlines
- Pinpoint Aimpoints
Initial Phase of Ground-truthing

<p>| | | | |</p>
<table>
<thead>
<tr>
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Final Phase of Ground-truthing
Designing the Database

- Database Server Selection
  - Oracle
  - PostgreSQL
  - MySQL

- Table Design and Creation
  - Target Table
  - Frame Table
  - Sequence Location Table
  - Image Table
Communication With The Database

- Database Must Interface with Filter Generators Written in the C Programming Language
- Demonstration of Methods of Communication with the Database
  - Connecting
  - Database selection
  - “Select”, “Update”, “Insert”, and “Delete” Queries
  - Displaying Retrieved Data
Importance:
- All Ground-truthed Information Currently in a File Format Known as Gt2

Purpose of Gt2 File Format
- Enable Filter Creating Programs to Accurately Analyze Image Sequences For Use in ATR

Selection of Language: Python
- Database Server Abstraction
- Flexibility
# Gt2 Format Basics

<table>
<thead>
<tr>
<th>Line Number</th>
<th>Contained Information</th>
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<tr>
<td>1</td>
<td>Sequence Location</td>
</tr>
<tr>
<td>2</td>
<td>Number of Tags</td>
</tr>
<tr>
<td>3 through (T+2)</td>
<td>References per Taget</td>
</tr>
<tr>
<td>(T+4) through (T*2+3)</td>
<td>Generic Taget Information</td>
</tr>
<tr>
<td>(T*2+4) through End of File</td>
<td>Target References</td>
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</tbody>
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Results

- “gt2import” Successfully Converts Data Currently in the Gt2 Format for Use in the Designed Database
- Communication With an External Database Proven to be Relatively Easy
- Newly Ground-truthed Sequences Were Easily Added
Conclusions

- Integration of a Relational Database With ATR Systems Is Possible
- Current Routines Can be Made More Flexible Through the Ability to Abstract Existing Tools from File Formats
- Database Integration Can Provide More Accurate Filters Thereby Improving ATR Systems’ Ability to Detect and Classify Targets
Areas For Further Study

- Extend Current ATR System to Access Designed Database Using Example Code
- Extend “gt2import” to Parse Wider Array of Formats
Questions