

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

Filter Set

INPUT FILENAME /disk/images5/framegrab/hwil_26.seqb

OUTPUT LIST FILE /users/frost/ground_truth/in_progress/hwil_26.gt2

Zoom Factor 2 Frame Increment 10r Step Current Frame 507 Range 1311

Mean 2238.2

0

Automatic

Threshold 0.850

Max Iterations 100

No. of Targets 2

.5 .1

AGC: lo end AGC: hi end Target No. 0

	0	1	2	3
NAME	T72	T72		
PRIORITY	PRIMARY	PRIMARY		
CLASS	1	1	0	0
TYPE	4	4	0	0
VARIANT	0	0	0	0
SPECIFIC	0	0	0	0
ASPECT	270	320	0	0
DEP_ANG	15	15	0	0

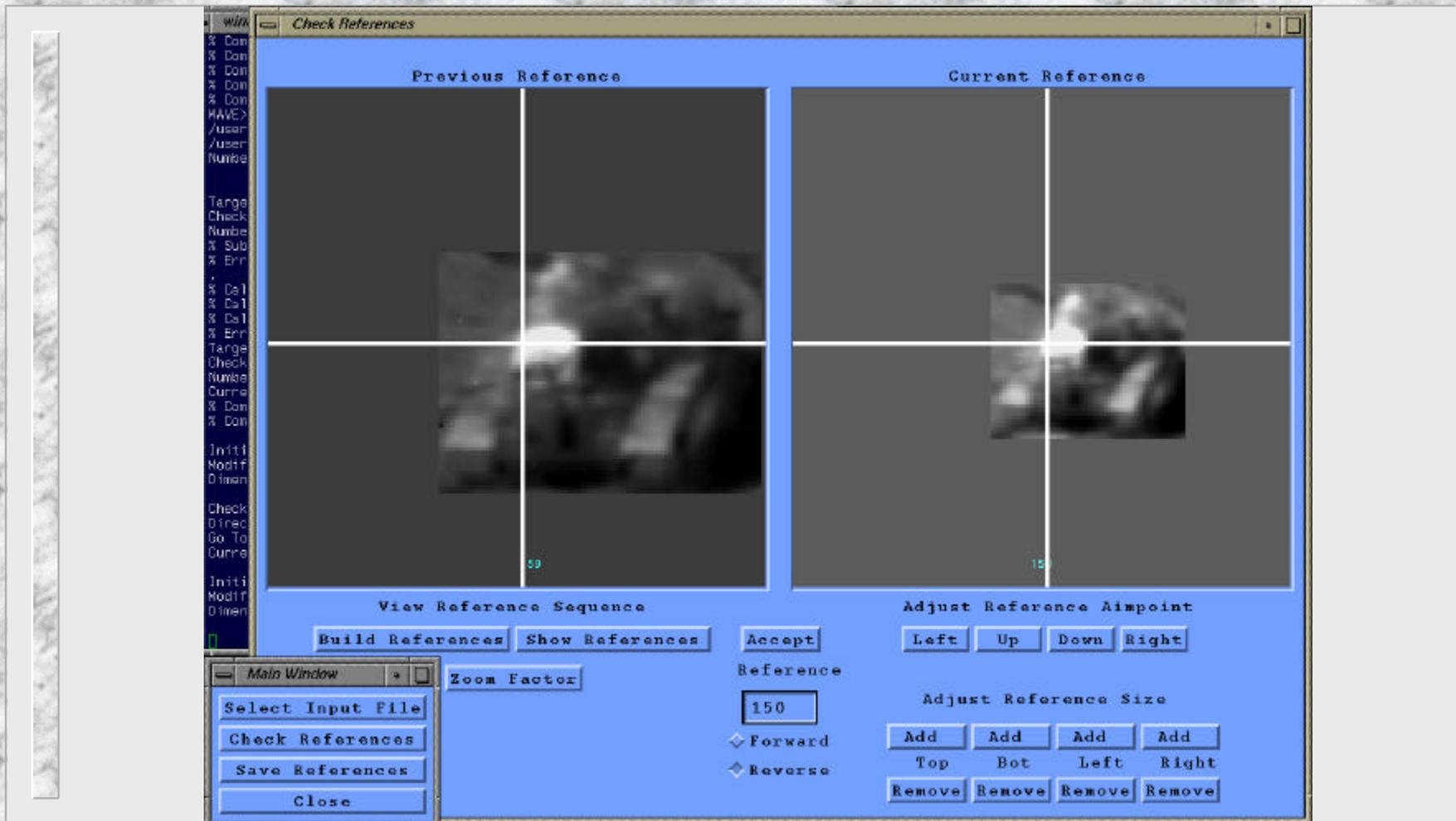
Normal View Difference View

Target Table

Main Window

- Get Image File
- Output File
- Image
- Load Groundtruth
- Sort & Save
- Reset
- Close

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

Loading Gt2 File Formatted 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

LINE NUMBER	CONTAINED INFORMATION
1	Sequence Location
2	Number of Tags
3 through $(T+2)$	References per Tag
$(T+4)$ through $(T*2+3)$ <small>(T = Number of Tags)</small>	Generic Tag Information
$(T*2+4)$ through End of File	Tag References

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

