



## SENIOR DESIGN PROJECT IN ELECTRICAL ENGINEERING



# AUTOMATIC OBJECT DETECTION IN AERIAL VIDEO

1/C CHANTEL FERGUSON, 1/C SCOTTY KENNEY, 1/C BOONE SWANBERG  
 ADVISOR: DR. REZA & CDR STAIER  
 SPONSOR: CG RDC (LIAISON: LT STEVE DUNN)

### PROJECT BACKGROUND

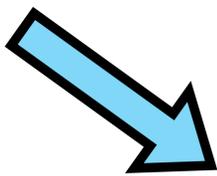
AUTOMATIC OBJECT DETECTION IS THE USCGA'S PROJECT TO HELP ASSIST WITH CURRENT FLIGHT OPERATIONS. CURRENTLY, THE COAST GUARD USES A TRAINED CREW TO OBSERVE AND IDENTIFY POTENTIAL OBJECTS IN THE WATER, AND THIS IS EXTREMELY DIFFICULT WHEN WEATHER CONDITIONS ARE EXTREME AND THE OBJECT BEING SEARCHED FOR IS APPROXIMATELY THE SIZE OF A BOWLING BALL. ALSO, THERE IS A SIGNIFICANT POSSIBILITY THAT SEARCH AND RESCUE (SAR) CASES OCCUR AT NIGHT, WHICH COULD MEAN THAT FLIGHT CREWS ARE FATIGUED, AND COULD POSSIBLY MISS AN OBJECT IN THE WATER. THIS PROJECT'S MAIN OBJECTIVE IS TO HELP ASSIST THE FLIGHT CREW BY SEARCHING FOR A POSSIBLE OBJECT IN THE WATER USING AN AUTOMATED SYSTEM.



### PROGRAMMING LANGUAGES



EXAMPLE OF PERSON IN WATER



### PROJECT PLAN

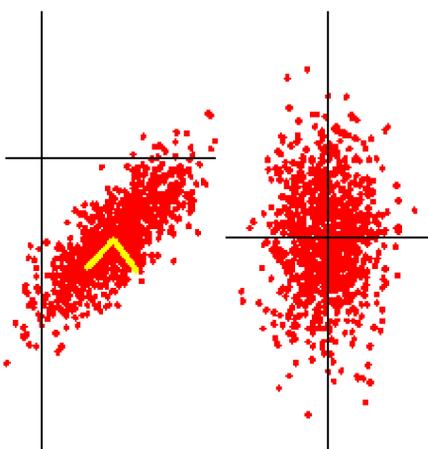
THE PROJECT PARAMETERS AND OBJECTIVES ARE AS FOLLOWS:

- IMAGE PROCESSING
  - DCT
  - KLT
- TEXTURE CLASSIFICATION
- REAL-TIME PROCESSING
- PROGRAMMING LANGUAGES
  - ORIGINALLY WRITTEN IN MATLAB
  - TRANSLATED TO C# WHICH IS UNIVERSAL



### KARHUNEN LOEVE TRANSFORM

Before KL-Transform      After KL-Transform



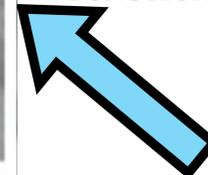
### RESULTS

THIS PAST SEMESTER, TRANSFERRING THE MATLAB SCRIPT TO C# HAS BEEN THE MOST IMPORTANT OBJECTIVE FOR OUR GROUP. BY COMPLETING THIS TRANSFER WE WERE ABLE TO MAKE THE SYSTEM RUN FASTER, SINCE THERE IS NOT AS MUCH OVERHEAD IN C#. ALSO, LAST SEMESTER WE CREATED A SIMULATION THAT TOOK OUR PROGRAM AND GENERATED AN OBJECT THAT READ HOW MANY TIMES WE MISSED, HIT OR RAISED A FALSE ALARM FOR THE TARGET. THIS GAVE US A GOOD INDICATION ON HOW OUR CODE WAS WORKING AND WHAT WE COULD POSSIBLY DO TO OPTIMIZE THE CODE THAT WE RECEIVED.

### PROJECT DELIVERABLES

THE PROJECT DELIVERABLES ARE AS FOLLOWS:

- DOCUMENTATION FOR BOTH THE KLT AND DCT
- WORKING MATLAB AND C# CODE
  - CAPABLE OF OBJECT DETECTION
  - COULD USE ADDED FUNCTIONALITY
- WOULD BE SIMPLE TRANSITION FOR FUTURE GROUPS TO ADD FUNCTIONALITY TO CODE



### DISCRETE COSINE TRANSFORM

