2015

Fish Book

Douglas Bianchi

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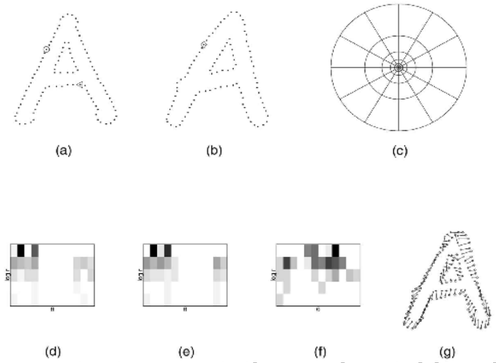
Faculty Advisor: Dr. Eraldo Ribeiro, Dept of Computer Science, Florida Institute of Technology

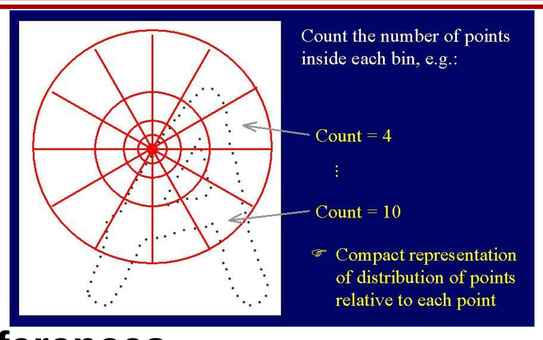
Abstract

The purpose of Fish Book is to test the application of Shape Matching with Shape Contexts to the identification of different fish species.

Point Matching Algorithm



Shape context computation and matching. (a) and (b) sampled edge points of two shapes. (c) Diagram of log-polar histogram bins used in computing the shape contexts. (d), (e), and (f) example shape contexts for reference samples marked by ○,◇,◁, in (a) and (b). Each shape context is a log-polar histogram of the coordinates of the rest of the point set measured using the reference points as the origin. Dark=large value. Note the visual similarity of the shape contexts for○ and◇, which were computed for relatively similar points on the two shapes. The shape context for◁, is quite different. (g) Correspondences found using bipartite matching, with costs defined by the x^2 distance between histograms.



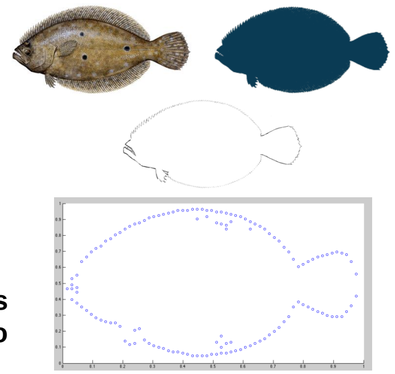
References

Belongie, Serge, Jitendra Malik, and Jan Puzicha. "Shape Matching and Object Recognition Using Shape Contexts." (n.d.): n. pag.www.cs.berkeley.edu/. Berkeley University of California. Web.

Image Data Collection

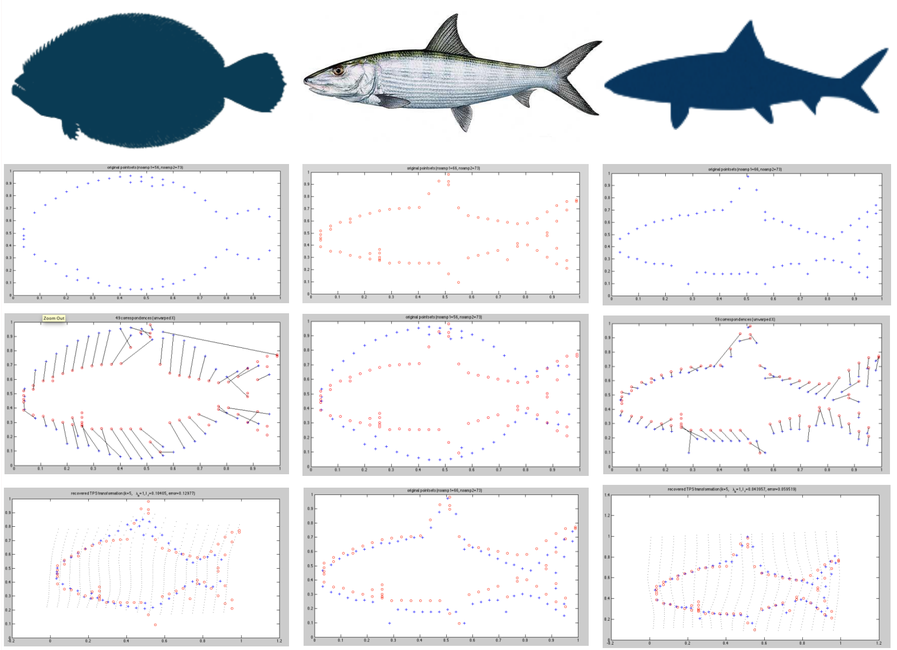
Collecting points from an image requires transitions of the image through four phases. Starting with a raw image, it must be converted to black and white. The third phase is the edge of the image acquired by running a 'canny' edge detection with a low threshold. The last step is to collect points off of the edge at an equal distance. These points need to be scaled down so they fit in a specific data set range:

Range of x-value = (0 < x-value < 1)
Range of y-value = (0 < y-value < 1)
Points in spread sheet are used to generate these values. If a point is located in row 38 of 125 and column 73 of 298, the x and y values will be calculated by:
x = 73 / 298 = .24496644
y = 38 / 125 = .30400000
Calculating the x and y values allows for different size images to scale into a comparable data range.



Fish comparison

Bonefish vs. Flounder **Bonefish vs. Bonefish**



Error = 0.12977 (12.9%) **Error = 0.059519 (5.9%)**

Acknowledgements

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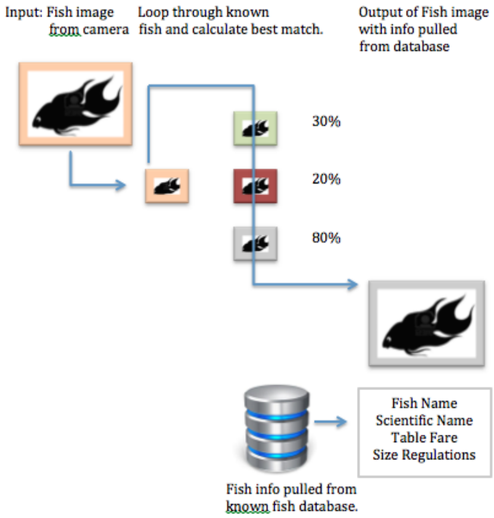
Fish Data Flow



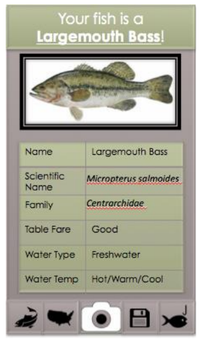
After image data is generated, it gets compared to existing data of known fish images. The comparison then outputs an error. The fish with the lowest error is match for the input.

Mobile application potential

Cover Mockup

Fish Data Table

Fish Name	Scientific Name	Scientific Family	Table Fare	WaterType	Water Temp.
Black Crappie	Pomoxis nigromaculatus	Centrarchidae	Good/Excellent	Freshwater	Cool/Cold
Bluefish	Pomatomus saltatrix	Pomatomidae	Poor/Good	Saltwater	Hot/Warm/Cool/Cold
Bonefish	Albula vulpes	Albulidae	Not Recommended	Saltwater	Hot/Warm
Crevalle Jack	Caranx hippos	Carangidae	Poor	Saltwater	Hot/Warm/Cool
Gulf Flounder	Paralichthys albigutta	Paralichthyidae	Excellent	Saltwater	Cool/Cold
Gray Triggerfish	Balistes capriscus	Balistidae	Good	Saltwater	Cool/Warm
Largemouth Bass	Micropterus salmoides	Centrarchidae	Good	Freshwater	Hot/Warm/Cool
Mullet		Mugilidae	Poor	Saltwater	Hot/Warm/Cool
Permit	Trachinotus falcatus	Carangidae	Good	Saltwater	Hot/Warm
Pompano	T. Carolinus	Carangidae	Excellent	Saltwater	Warm
Red Drum	Sciaenops ocellatus	Sciaenidae	Excellent	Saltwater	Hot/Warm/Cool
Snook	Centropomus undecimalis	Centropomidae	Excellent	Saltwater	Hot/Warm/Cool
Tarpon	Megalops atlanticus	Megalopidae	Not Recommended	Hybrid	Hot/Warm/Cool
Tripletail	Lobotes surinamensis	Lobotidae	Excellent	Saltwater	Warm



UI Prototype

Application with a purpose: Every state has their own wildlife conservation programs. Here in Florida, the FWC is constantly looking for ways to promote catch and release while still finding a way to understand the current populations of fish based on locations. An application of this nature with integrated GPS would allow for groups like the FWC to receive accurate identification of fish, with estimated sizes and precise GPS location data. Collecting data and understanding up to date fish habits would be more simple then ever with beginner to professional anglers taking pictures of their catch and sending data directly to groups like the FWC.