Feature Selection using Dynamic Binary Particle Swarm Optimization for Arabian Horse Identification System

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Outline

- Introduction.
- Problem Statement.
- Proposed Methodology:
  - Phase I: Pre-processing.
  - Phase II: Segmentation.
  - Phase III: Feature Extraction.
  - Phase IV: Feature Selection.
- Conclusions & Future Work.
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Introduction

- **Need for Arabian Horse Identification**
  - Biosecurity.
  - Retrieval after theft.
  - Fairness in competition.
  - Medical record management.
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Problem Statement

Traditional Identification Methods

Tattooing

Ear Tagging

Branding
Problem Statement

Using Biometric identifiers (contactless methods) for identification and getting rid of harmful identification methods.
Problem Statement

(a) Horse iris

(b) Human iris
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Phase I: Pre-processing

- Image Resizing
- Convert to grayscale
- Contrast Stretching
- Noise Removal

Input Image

Processed Image
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Phase II: Segmentation

Pre-Processing:
- Image Resizing
- Convert to grayscale
- Contrast Stretching
- Noise Removal

Segmentation:
- Otsu-IFOA
- Opening & Masking
Phase II: Segmentation (continued)

Otsu-IFOA Segmentation

Processed Image

Thresholded Image
Binary Mask
Segmented Area

Number of Pixels

0.015
0.01
0.005
0.001
0

gray levels

0 50 100 150 200 250 300

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Phase III: Feature Extraction

Pre-Processing
- Image Resizing
- Convert to grayscale
- Contrast Stretching
- Noise Removal

Segmentation
- Otsu-FOA
- Opening & Masking

Feature Extraction
- Gabor Filtering
- TDCT
Phase III: Feature Extraction

(Gabor Filtering)
Phase III : Feature Extraction

(Gabor Filtering)
Phase III: Feature Extraction (TDCT)

Pre-Processing
- Image Resizing
- Convert to grayscale
- Contrast Stretching
- Noise Removal

Segmentation
- Otsu-FOA
- Opening & Masking

Feature Extraction
- Gabor Filtering
- TDCT
Phase IV: Feature Selection

Pre-Processing
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Feature Extraction
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Feature Selection
- DBPSO
The Flowchart of DBPSO

Generate and initialize particles with random position \( (X) \) and velocity \( (V) \)

\[ F = \sqrt{\sum_{i=1}^{A} (\mu_i - \mu_0)^T (\mu_i - \mu_0)} \]

\( G_{best} = \{1,1, \ldots ,1\} \)

\( i=0 \)

Evaluate position (Fitness)

If fitness\((X) > \) fitness\((I_{best})\)

\( I_{best} = X \)

If fitness\((X) > \) fitness\((G_{best})\)

\( G_{best} = X \)

\( G_{best} \) at \( i+1 \) = \( G_{best} \) at \( i-1 \) & \( G_{best} \)

Update Position

Update Velocity

Return the best solution
DBPSO Results

- We have 1800 extracted features.
- 265 selected features using DBPSO.
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Conclusions & Future work

- Automatic *Periocular region* segmentation using Otsu-IFOA.
- Feature Extraction (Gabor Filter + TDCT).
- Feature Selection using DBPSO.
- Selected Features can be used for *Arabian Horse Identification System*.