Automated Diagnosis of Dry Eye using Infrared Thermography Images

Dry Eye (DE) is a condition of either decreased tear production or increased tear film evaporation. Prolonged DE damages the cornea causing corneal thinning, scarring and perforation. There are no uniform diagnosis tests available and the current diagnostic methods are subjective, uncomfortable and invasive.

An efficient, fast, non-invasive, automated technique is developed to identify normal and DE using infrared thermography images. Classification accuracy of 99.8%, sensitivity of 99.9% and specificity of 99.4% is being reported on using this technique.

Potential Applications
This technology will be useful for
- Eye specialty clinics/ eye doctors
- Contact lens manufacturers
- Algorithm can be implemented and used in any polyclinics or hospitals without any extra cost

Customer Benefits
- Better diagnostic system for general practitioners
- No user interaction required
- More objective and reproducible diagnosis
- System is completely non-invasive and automatic

Technology Features & Specifications
- Nonlinear method called Higher order spectra is used to extract features
- Features are ranked using t-test ranking strategy
- These ranked features are fed to various classifiers to select the best classifier using minimum number of features.
- The classifiers used are: K-Nearest neighbour (KNN), Nave Bayesian classifier (NBC), decision tree (DT), probabilistic neural network (PNN) and Support vector machine (SVM)
- Thermography images can be used as a tool to educate patients to be more compliant to lubricants and other suggested behavioural modifications
- Ten-fold stratified cross validating data resampling method is used. Hence the system is more prone to predict the unknown class more accurately

Market Trends and Opportunities
The ophthalmology devices market research report studies and analyses the market by types. The market is categorized into diagnostic and monitoring devices, surgical devices, and vision care products. The market inclusive of diagnostic, monitoring and surgical devices is expected to grow at a CAGR of 6.8% to reach $9,466.7 million by 2018. Whereas, vision care market is anticipated to reach $33,725.3 million by 2018 at a CAGR of 2.9%. (Source: Marketsandmarkets.com)

GlobalData predicts Dry Eye Syndrome therapeutic sales across the US, France, Germany, Italy, Spain, UK, Japan, China, and India to grow from around $1.6 billion in 2012 to $5.5 billion in 2022 at a Compound Annual Growth Rate (CAGR) of 12.8%. (Source: healthcare.globaldata.com)

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