In the present thesis, the application of circular grating Talbot interferometer and digital holographic interferometry (DHI) is investigated for scientific and industrial measurements. A new application of circular grating Talbot interferometer to study the effect of magnetic fields on the temperature and temperature profile of butane premixed, partially premixed and diffusion flames are investigated and practically demonstrated. Experimental results reveal that the combustion temperature in a flame can be controlled by the application of a suitable magnetic field and can be used to improve the combustion characteristics. This investigation is useful to improve the combustion process and increase the combustion efficiency. Circular grating Talbot interferometer is also investigated for its use to measure the in-plane displacement from 5 micrometer to 1 millimetre range. This method can be used as an alternative method of measurement of in-plane displacement. Further Circular grating Talbot interferometer is used for the measurement of the temperature and temperature profile of wick-stabilized micro-diffusion flame under the influence of magnetic field.

Application of digital holographic interferometry is also investigated to measure temperature, temperature profile and temperature fluctuations with in micro diffusion flame. Digital holography is ideally suited to study the micro flames.

In addition to this Talbot effect/self-imaging effect is demonstrated for cell level imaging of biological specimens like Onion epidermis cells and Red blood cells etc. Experimental results shown that the technique is simple, robust and promising for its use for clinical applications.