Myopia, also called short-sightedness, is a condition, where the distant objects cannot be seen well, but appear blurry. Nowadays this condition has grown to the epidemic sizes. According to recent Nature magazine around sixty year ago only 10-20% of Chinese population were myopic. Nowadays 90% of young Chinese people have to wear glasses or contact lenses for myopia correction. The situation still looks better in Europe, where among young people around 50 % need to aid their sight due to myopia. If believing predictions, in the end of 2020 one-third of the world's population will encourage this problem.

This is why symptomatic treatment is not enough. In order to develop a casual treatment, more insight about the human eye vision control system is needed.

In practice, none optical system is perfect. If it is not perfect, it is said that it contains aberrations. Human eye is also an optical system and it is no exception in terms of aberrations. The aberrations can be divided into Lower Order Aberrations (LOA) and Higher Order Aberrations (HOA). Even though the latter are not taken into consideration in daily ophthalmology practice, it may be the case, that they play an important role in the vision process. For example it has been shown, that people, whose eyes contained greater amount of HOA (up to some limits) had also wider depth of focus (DOF).

The human eye is not a static system, like e.g. a camera, where all elements are more or less stable. In the human eye all elements change their state very quickly in time. The tear film covering the eye deteriorates, so we need to blink. Pupil changes its diameter depending on the amount of external light. It also pulsates due to heart beating. Intraocular lens slightly changes its shape. All these factors contribute to small dynamic changes of eye's aberrations, called microfluctuations of aberrations.

The aberrations can be measured using devices called aberrometers. Mathematical analysis can provide information about the amount of certain aberrations in the optical system, e.g. the eye and their dynamics. The measurements of aberrations popular practice in science and the aberrometers are nowadays commercialized.

Even though a lot of studies have been made about the aberrations in the human eye, their time dynamics have never been investigated in terms of differences between eyes with different refractive powers, that is e.g between myopes and emmetropes. Using data from extensive data base from Queensland University of Technology (Australia) we plan to deeply investigate these differences, using advanced mathematical tools and computer simulations. We will study currently existing models of HOA' dynamics and implement new ones which take into consideration differences between aberrations' behavior in different refractive groups. We will investigate the role of HOA' dynamics in the human eye, mainly in terms if depth of focus and vision quality control. Finally, using optical modeling, we will investigate how small changes in parameters of anatomical structures of different eyes (particularly myopic and emmetropic) may cause the observed changes in HOA.

The usual practice in ophthalmology is to correct the vision using glasses or contact lenses. In some cases the refractive surgery procedures are implemented. The global costs for myopia correction only in 1990 were 4.6 bilion USD. These costs rapidly increase with myopia expansion as there is growth in need for educating and hiring more specialists, building new ophtalmological centers and expanding existing ones.

Understanding the differences between the myopes and other refractive groups may possibly contribute to discovery of the cause of nowaday's myopia epidemic. There is every hope that such knowledge would provide the development of casual treatment. This would have an enormous contribution to society and improvement of the quality of many people's lives.