This thesis focuses on the study of the effects of model gravitational waves on the trajectories of light rays coming from distant stars. We examine the linearized theory of gravity, particularly in the context of the Bondi-Sachs and Newman-Penrose formalism. The results show how the apparent positions of distant stars are affected by gravitational waves. Additionally, we have identified a new gauge-invariant quantity given by the motion of stars as a function of time and angular coordinates.