1154-65-2252 **Victor Ginting*** (vginting@uwyo.edu). *An A Posteriori Error Estimation for Numerical Solution of Richards Equation.* Preliminary report.

We first discuss several time integration techniques of system of ordinary differential equations characterized by strong nonlinear coupling of the unknown variables. This system is a result of spatial discretization (using such as finite element or finite difference) of the Richards Equation, which is a governing mathematical principle for modeling water infiltration through a subsurface. The nature of Richards Equation is further complicated by the fact that the rate of change of the quantity of interest represented by a time derivative is also nonlinear. We formulate a general framework of the numerical time integration as a discontinuous Galerkin method in temporal variable. The actual implementation of a particular scheme is realized by imposing certain finite element space in time variable to the variational equation and appropriate "variational crime" in the form of numerical quadrature for calculating the integration in the formulation. Once this is in place, we derive an adjoint-based error estimator for the approximate solution from the scheme. The adjoint problem is obtained from appropriate linearization of the nonlinear system. Several numerical examples are presented to illustrate performance of the scheme and the error estimator. (Received September 17, 2019)