

# ON GENERALIZED DIFFERENTIALS AND INVARIANCE OF DIFFERENTIAL INCLUSIONS

EWA GIREJKO, ZBIGNIEW BARTOSIEWICZ (BIAŁYSTOK, POLAND)

Forward invariance of time-dependent differential inclusions with respect to a constraint multifunction is studied with the aid of generalized differentials. A new necessary condition of invariance is given, where generalized differential quotients are used. They generalize the classical derivative and allow to differentiate set-valued maps and single-valued maps that are not differentiable in the standard sense. Generalized differential quotients are based on set-valued maps that are approximable in the Cellina sense. Unlike ordinary derivatives, they are not unique, so we exploit only the minimal ones (with respect to inclusion of sets). It is shown that the contingent derivative, more often used in the theory of differential inclusions, contains all minimal generalized differential quotients. Thus they are more suitable (namely, smaller without superfluous elements) for expressing criteria of invariance, and they better describe the directions that are tangent to the trajectories of differential inclusions. This gives a stronger necessary condition of invariance than the one expressed with the aid of contingent derivative.