Integrated Play-Back, Sensing, and Networked Control*

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Sensing, actuation, and decision units can control a remote physical environment and enable physical actions regardless of distance. However, the effectiveness of networked control depends on its ability to tolerate network non-determinism, which in turn can be enhanced by the use of play-back buffers. Although play-back has been intensively studied in multi-media applications, play-back schemes differ significantly in networked control, which is characterized by different performance metrics and a different sequence of communication events. The primary contribution of this work is an end-to-end algorithm that integrates play-back buffering, sensor sampling, and control. The algorithm is extensively validated on simulations and real-time wide-area emulations. The integrated algorithm canceled the effect of disturbances as much as a proportional controller under ideal network conditions.

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