

# Bi-directional Trajectory Tracking with Variable Block-Size Motion Estimation for Frame Rate Up-Converter

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Technology of display has been enhanced in recent years, number of frames can be played is up to 120 frames and even 240 frames per second. However, the capability of video recorder is limited to capture 30 Hz or 60 Hz per second at 1920×1080. Hence, the resolution in temporal domain is not enough to fulfill the requirement of display. This paper presents a real-time system entitled, bi-directional trajectory tracking motion-compensated frame rate up-converter (BiTTMC-FRUC) that is capable of converting the video with 1920×1080 spatial resolution from 60 Hz to 120 Hz and providing high visual quality simultaneously (Figure 1). In order to provide better visual quality, most of algorithms that increase the frame rate of video will apply complicated approaches to achieve high performance but these algorithms would not be able to port onto a real-time platform successfully. Our BiTTMC-FRUC was designed based on algorithm/architecture co-exploration [1] and hence our design found a feasible solution in both algorithmic and architectural design.



Our design is successfully ported on Altera FPGA and its system architecture is displayed at Figure 1. To smoothly achieve the porting procedure, we assess the complexity of algorithm at the early design phase; hence, we could modify our algorithm to reduce resource cost in the future but algorithmic performance would still be retained at the comparative level. Data flow model is used to bridge algorithm and architecture and two factors, data granularity and processing order, in data flow play the significant roles that influence complexity indeed. Subsequently, we could expand our design space via changing different processing orders at various data granularities to obtain the feasible solution which is may the best one for targeted platform.

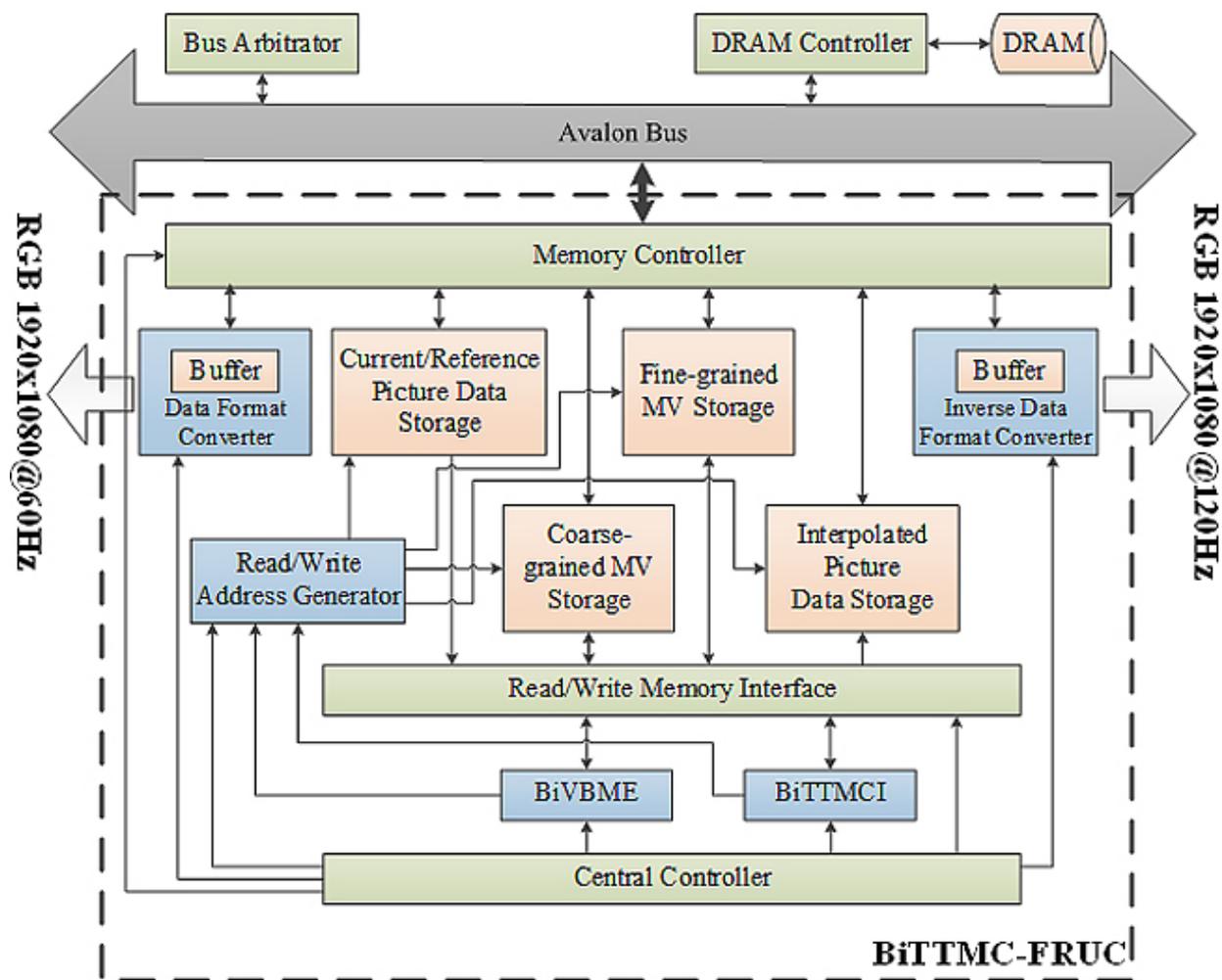


Figure 1 System architecture of our BiTTMC-FRUC

Reference:

1. G. G. Lee, Y.-K. Chen, M. Mattavelli, and E. S. Jang, "Algorithm/Architecture Co-Exploration of Visual Computing on Emergent Platforms: Overview and Future Prospects," *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 19, Iss. 11 pp. 1576-1587, 2009.