Local Spatio-Temporal Propagation and Constraint Based Model Generation for 1ms Foreground Detection System
修士課程卒業 CAI PEIKUN

➢ Background
- Key for human-machine interaction applications
  - Projection mapping
  - Self-driving
  - Surveillance
- Target:
  - Implement 1ms foreground detection system.
- Challenges:
  - High speed up & Reduce storage consumption
  - Robust for illumination change
  - Distinguish different objects

➢ Proposal
- Proposal 1: Local Spatio-Temporal Propagation
  - Conventional work: Build models for all pixels
  - Proposed: Only build models for foreground blocks
- Proposal 2: Local Linear Illumination correlation
  - Conventional work: Global analysis
  - Proposed: Blocks are processed in parallel
- Proposal 3: Local Keypoint Constraint
  - Conventional work: Lack of constrained conditions
  - Proposed: Feedback

➢ Evaluation result
- Detection accuracy:
  - | Model | ViBe | P1 | P1+P2 | P1+P2+P3 |
  - | Average | 78.78% | 80.12% | 80.56% | 85.17% |
- Hardware performance:
  - Input frame rate: 784fps
  - Processing delay: 0.908ms/frame
- Resource Utilization:
  - # LUT: 131976 (64.76%)
  - # Flip Flop: 131209 (32.19%)
  - # BRAM: 87.50 (19.66%)
  - # DSP: 36 (4.29%)

➢ Conclusion
- Average F-score of P1+P2+P3 is 85.17%, 6.28% higher than original ViBe. And reducing storage around 3 times
- Solving the problems caused by illumination change and multi-objects