

SfM-Net: Learning of Structure and Motion from Video :Implementation

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Representation of SfM-net

- **Implementation:** Tensorflow 1.0.1, Keras 2, Jupyter Notebook
- Using “Tensorboard”

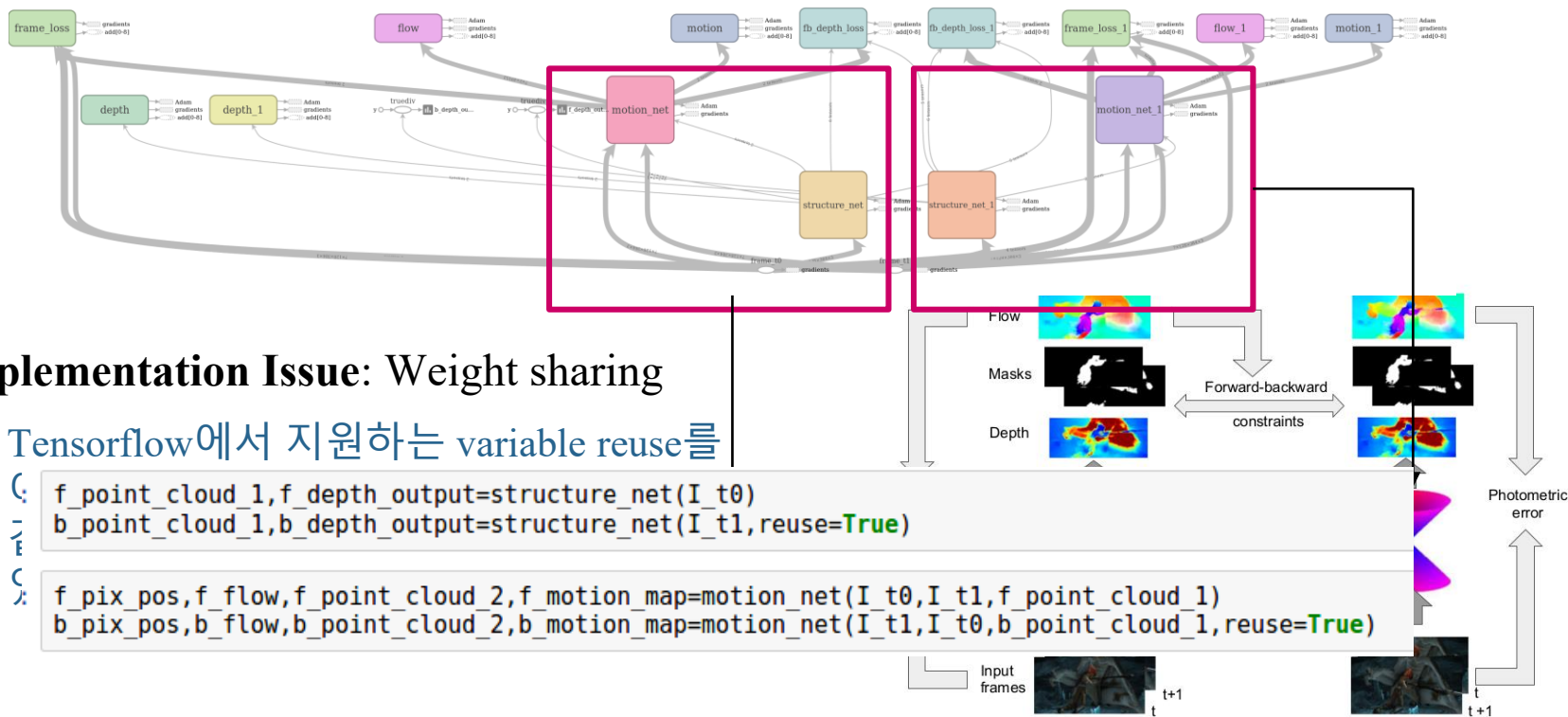
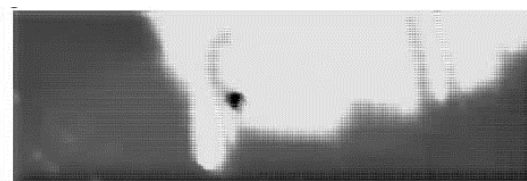
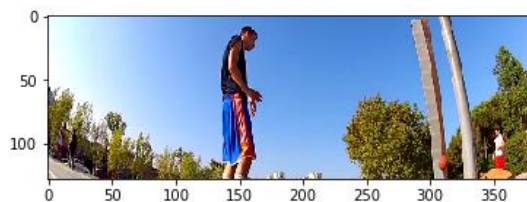


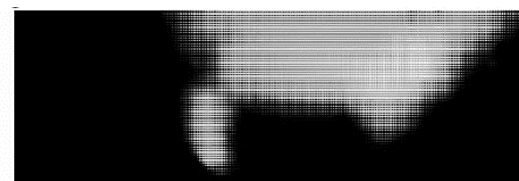
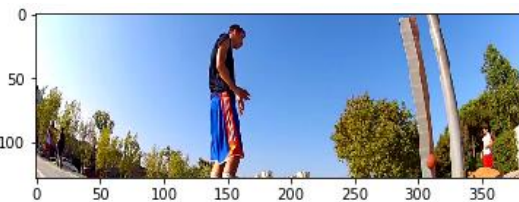
Figure 1: Concept of SfMnet

Problem #1

- SfM-net 수렴 불안정 문제
 - 학습에 실패하는 경우가 많음.
 - Learning rate: 0.0003
 - Self-teaching
- Loss 변화 추이



Forward frame



Backward frame

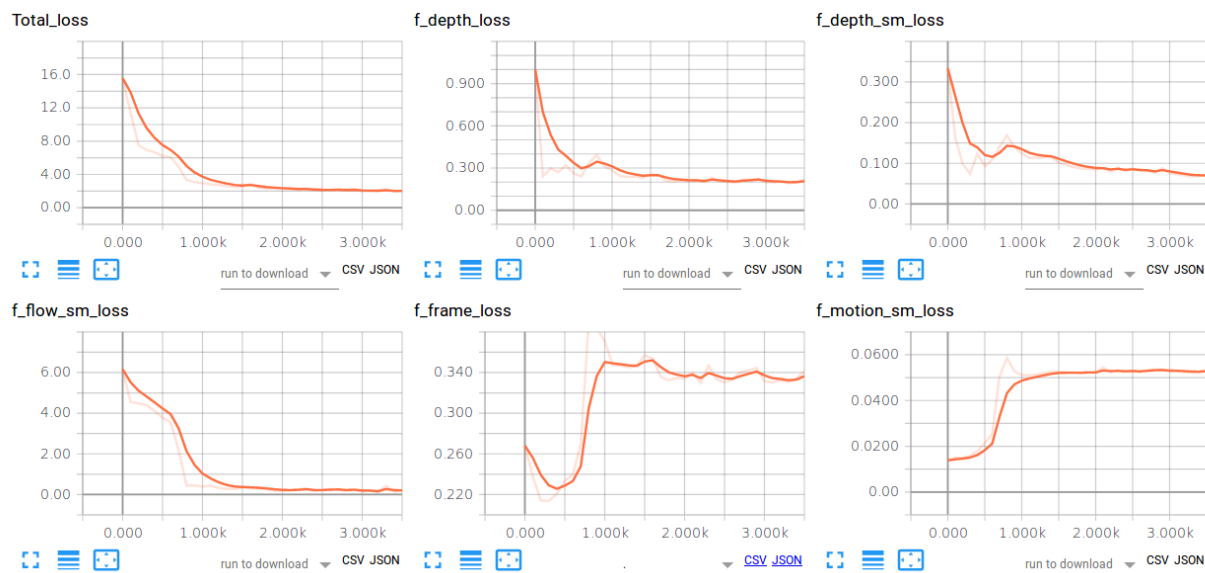
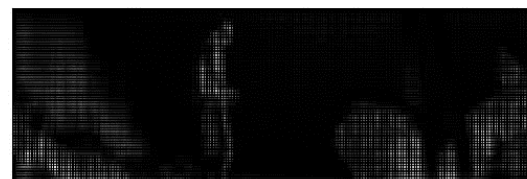
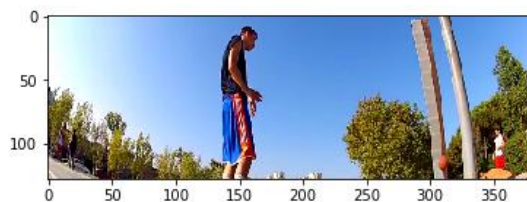


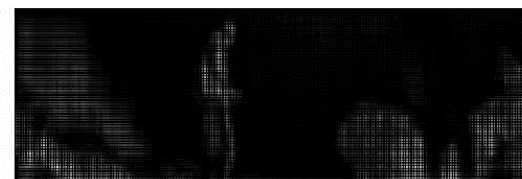
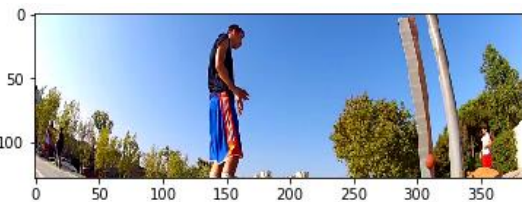
Figure 2: Loss 별 변화 추이

How to train well

- Tip
 - Learning rate: 0.00001 \rightarrow Time!
 - Batch normalization or Guiding
 - Depth Map: Bias 1, max Depth 100
- Loss 변화 추이



Forward frame



Backward frame

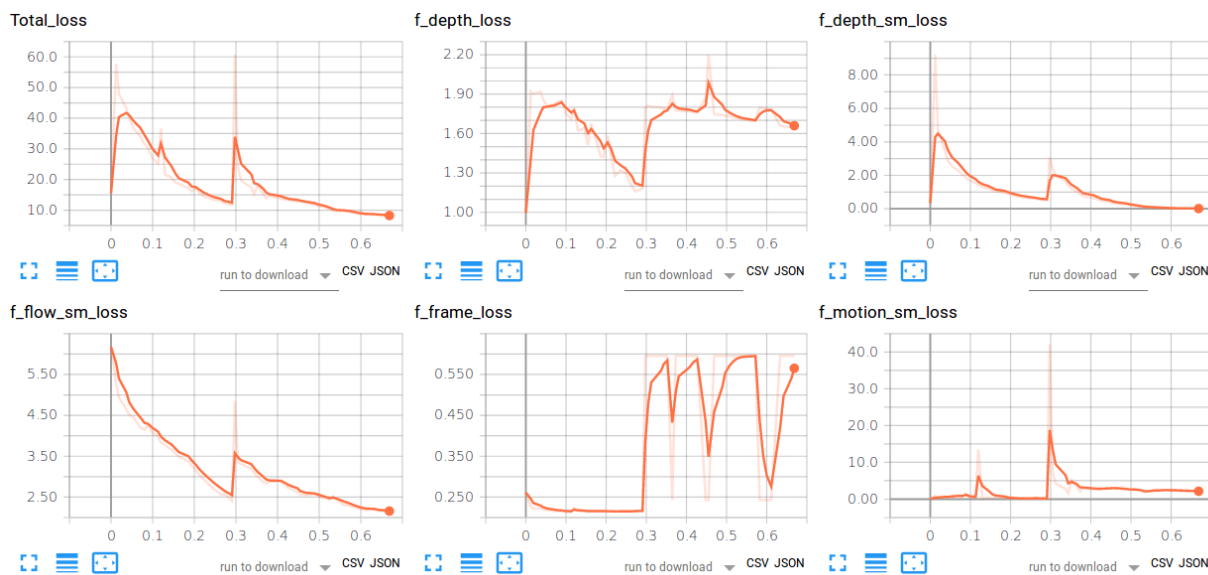


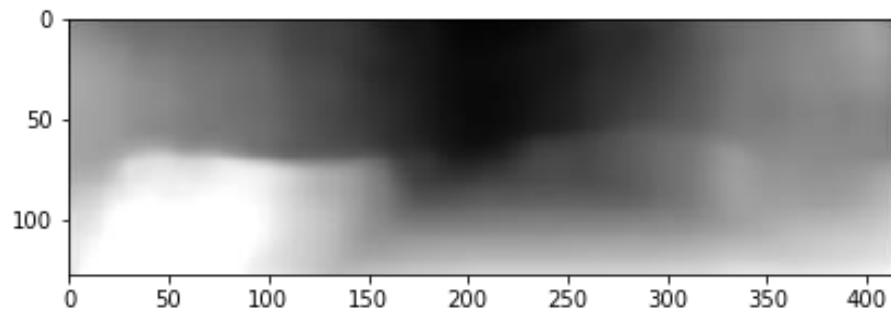
Figure 3: Loss 별 변화 추이

Problem #2

- 학습시킨 동영상과 성격이 다른 동영상을 Input으로 넣었을 때, Depth map 자체의 생성 실패

▪ Iteration: 190532

Train video



Test video

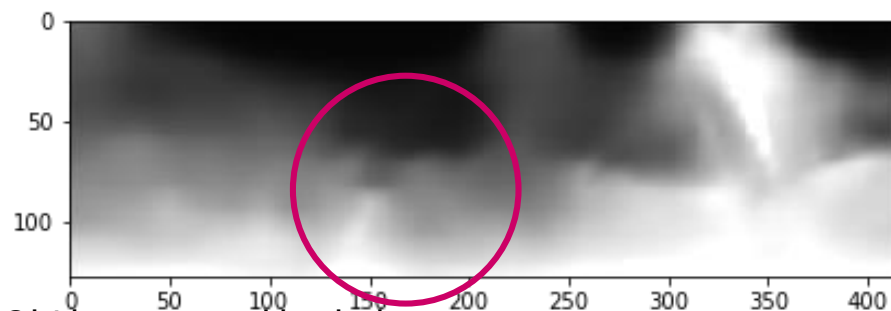


Figure 4: 성격이 다른 동영상으로 Test한 결과

Conclusions

- Network Input / Output
 - Input: a pair of input frame I_t, I_{t+1}
 - Output: Depth map, Flow map, Camera motion
- Output 관련 Problem: 상대적 Depth
 - 정확한 Depth map을 추출하기 위해서는, camera intrinsic matrix가 필요
 - 추론 Data의 신뢰성 문제
- Neural Network 학습시의 문제점
 - 학습과정의 불안정
 - Fine tuning에서의 hyper-parameter 조정 필요
 - Filter 및 학습과정을 실시간으로 관찰할 필요가 있음
 - 학습 시 사용한 동영상과 성격이 다른 동영상의 결과
 - 학습시킨 weight를 바로 사용하는 것은 어려움
 - 하지만, self-teaching이 가능하므로, Warm-up 후 사용할 수 있을 것으로 판단