Multi-object Generation with Amortized Structural Regularization: Appendix

A   Algorithm

The training algorithm of ASR is described in Algorithm 1.

B   The reconstruction results

In this section, we illustrates all the inference results of AIR, AIR-pPrior and AIR-ASR on all settings. Results can be found in Fig.1 ∼ Fig.5. Some of them are included in the main body.

(a) The reconstruction results of AIR-13.

(b) The reconstruction results of AIR-pPrior-13.

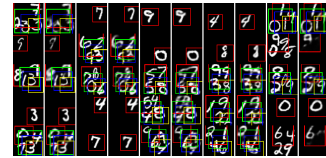(c) The reconstruction results of AIR-ASR-13.

Figure 1: The reconstruction results of Multi-MNIST on 1 or 3 objects.

(a) The reconstruction results of AIR-14.
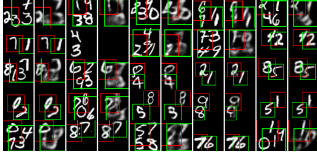
(b) The reconstruction results of AIR-pPrior-14.

(c) The reconstruction results of AIR-ASR-14.

Figure 2: The reconstruction results of Multi-MNIST on 1 or 4 objects.

Algorithm 1 Stochastic Gradient Ascent Training of ASR

Input: data x, maximum steps K, learning rate η, penalty R.
Initialize parameters θ_0 and ϕ_0, and $n = 1$.
repeat
    $z_{pres}^0 \leftarrow 1, z^0 \leftarrow \mathbf{0}, t \leftarrow 0$
    repeat
        Update $t \leftarrow t + 1$
        Sample $z_{pres}^t \sim q(z_{pres}^t | z^{<t}, x)$
        Break if $z_{pres}^i = 0$
        Sample $z^t \sim q(z^t | z^{<t}, x)$
    until $t = K$
    Update $z \leftarrow (z^1, \cdots, z^t)$
    Update $KL \leftarrow \log \frac{q(z)}{p(z)}, Rec \leftarrow \log p(x|z), r \leftarrow R(q)$
    Update $J'(\theta, \phi) \leftarrow Rec - KL - r$
    Update θ and ϕ: $\theta_n \leftarrow \theta_{n-1} + \eta \frac{\partial J'(\theta,\phi)}{\partial \theta}, \phi_n \leftarrow \phi_{n-1} + \eta \frac{\partial J'(\theta,\phi)}{\partial \phi}$
    Update n: $n \leftarrow n + 1$
until Both θ and ϕ converge.

(a) The reconstruction results of AIR-24.

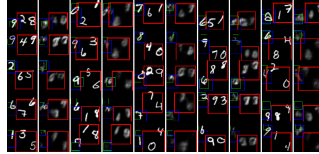(b) The reconstruction results of AIR-pPrior-24.

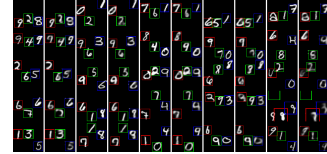(c) The reconstruction results of AIR-ASR-24.

Figure 3: The reconstruction results of Multi-MNIST on 2 or 4 objects.

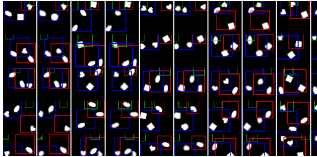
(a) The reconstruction results of AIR-3.

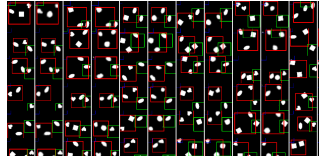(b) The reconstruction results of AIR-pPrior-3.
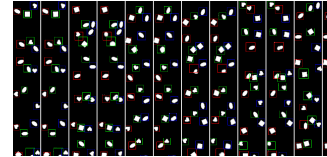
(c) The reconstruction results of AIR-ASR-3.

Figure 4: The reconstruction results of Multi-MNIST 3 objects without overlapping.

(a) The reconstruction results of AIR-3.

(b) The reconstruction results of AIR-pPrior-3.

(c) The reconstruction results of AIR-ASR-3.

Figure 5: The reconstruction results of Multi-Sprites 3 objects without overlapping.