MDFN: Mask Deep Fusion Network for Visible and Infrared Image Fusion without Reference Ground-Truth

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1 COMPARISON WITH STATE-OF-THE-ART

In this complementary file, we display some further experimental results obtained by MDFN and different fusion methods including: dense block based fusion method(DenseFuse)[1], FusionGan[2], the gradient transfer fusion method(GTF)[3], multi-layer fusion strategy-based method(VggML)[4], DeepFuse[5], ResNet-ZCA[6], RFN-Nest[7]. Specifically, we show four pairs of images as well as their corresponding quantitative metrics to demonstrate the superiority of our method.

Four pairs of images fused by various methods are shown in Fig.1,2,3,4. It is easy to observe that the proposed approach MDFN achieves the outstanding performances. Compared with Deep Learning methods: VggMl, DeepFuse, Densefuse, FusionGan, MDFN is not only capable of generating more remarkable interested pixels existing in the infrared image, but also obtaining much clearer texture details.

In contrast to DeepFuse, although it gains a satisfactory performance in the human visual perception, it almost fails to get the thermal radiation information, being far from our requirement. Besides, the quality of the fused images computed by FusionGAN is also inferior to that obtained by MDFN in both thermal radiation and texture details.

The quantitative comparisons associated with the fused images in Fig.1,2,3,4 are listed in Tab.1. The best values and the second-best values are marked in red and blue, respectively. Obviously, our presented network achieves the noticeable performances in most of cases. In particular, MDFN are superior to other comparison methods in most remaining metrics except VIF. As for VIF, there are also competitive improvements compared with part of comparison approaches.

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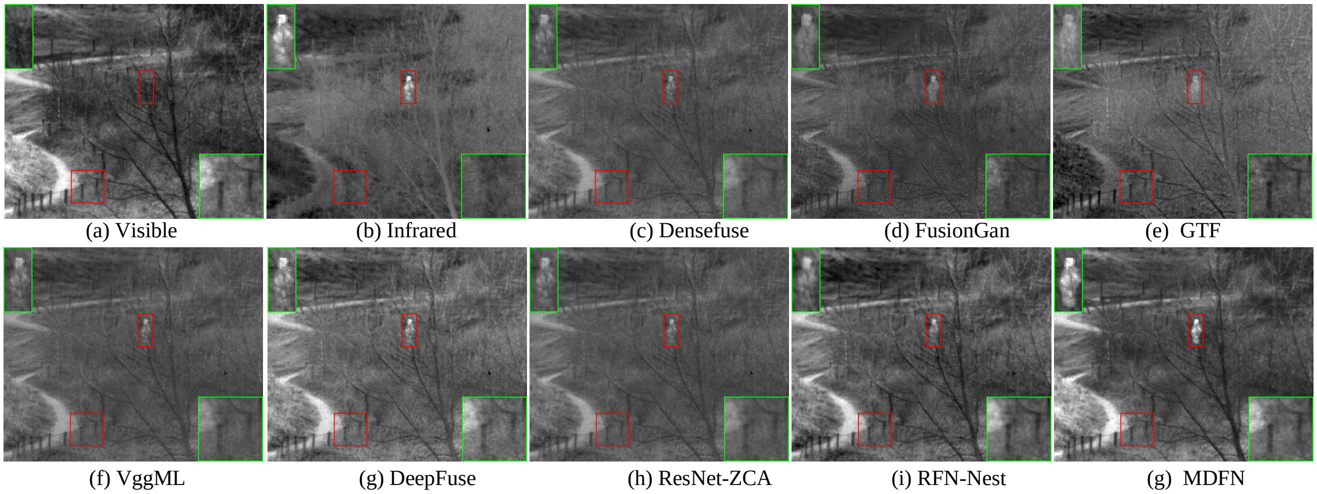
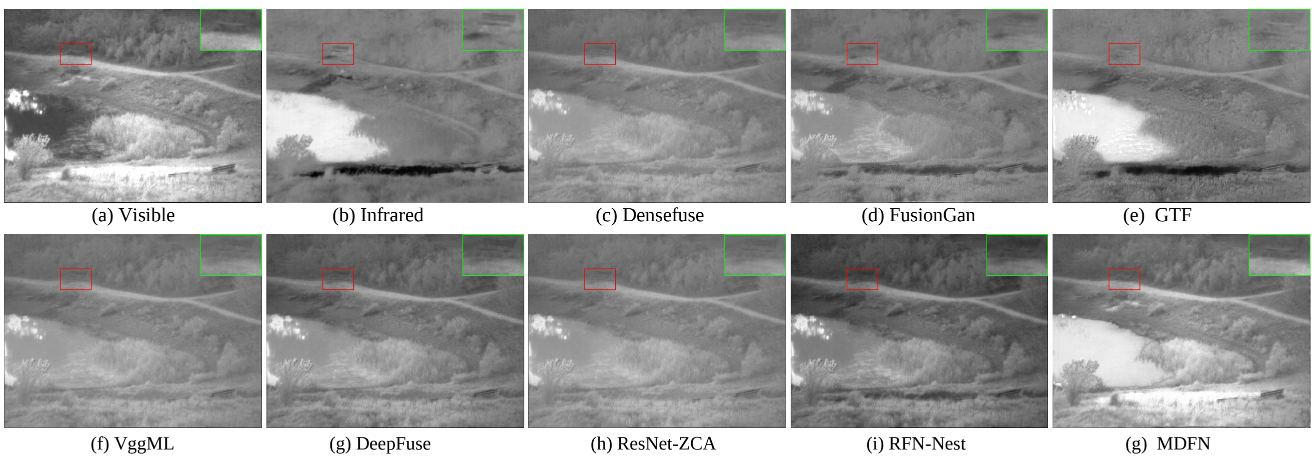


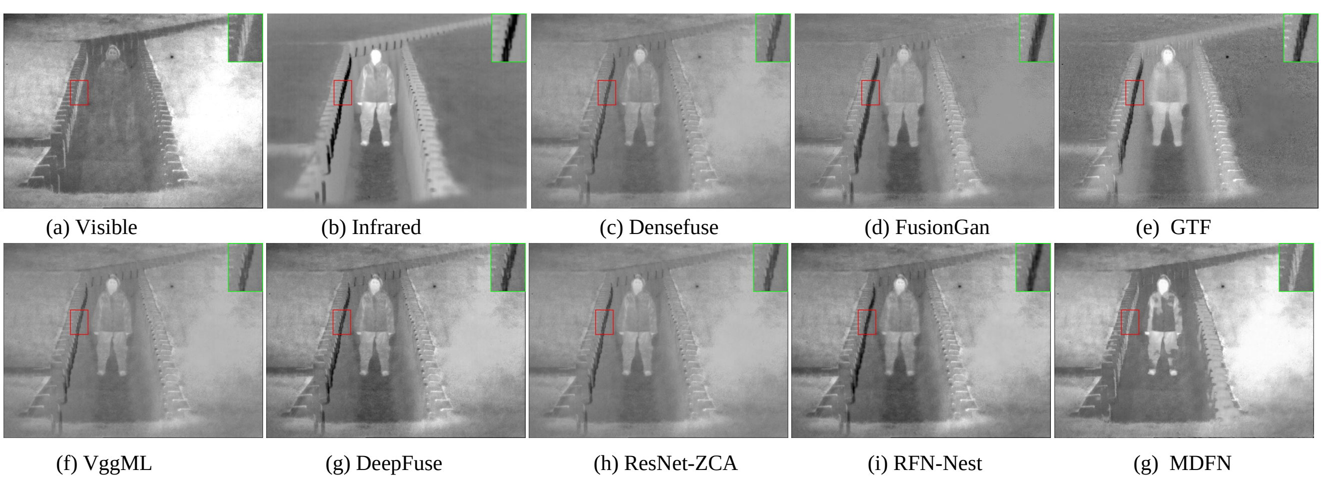
(a) Visible (b) Infrared (c) Densefuse (d) FusionGan (e) GTF
(f) VggML (g) DeepFuse (h) ResNet-ZCA (i) RFN-Nest (g) MDFN

Figure 1: Fused images obtained by different fusion methods and the proposed MDFN



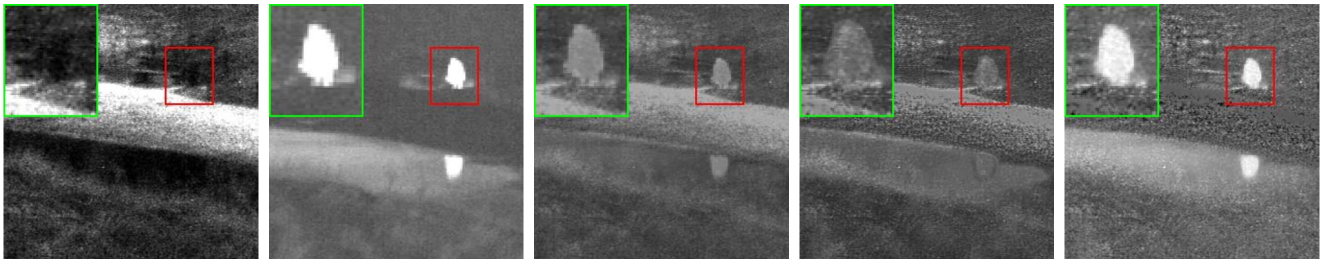
(a) Visible (b) Infrared (c) Densefuse (d) FusionGan (e) GTF
(f) VggML (g) DeepFuse (h) ResNet-ZCA (i) RFN-Nest (g) MDFN

Figure 2: Fused images obtained by different fusion methods and the proposed MDFN

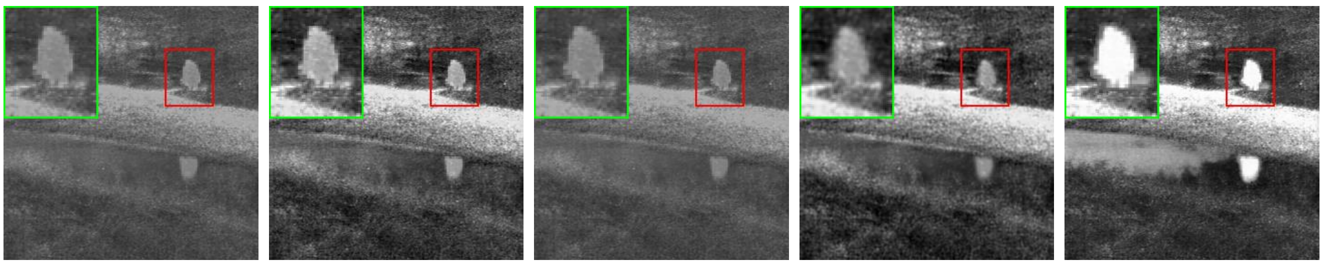


(a) Visible (b) Infrared (c) Densefuse (d) FusionGan (e) GTF
(f) VggML (g) DeepFuse (h) ResNet-ZCA (i) RFN-Nest (g) MDFN

Figure 3: Fused images obtained by different fusion methods and the proposed MDFN



(a) Visible (b) Infrared (c) Densefuse (d) FusionGan (e) GTF



(f) VggML (g) DeepFuse (h) ResNet-ZCA (i) RFN-Nest (g) MDFN

Figure 4: Fused images obtained by different fusion methods and the proposed MDFN

Table 1: Quantitative results on the fused images obtained by different methods. Red means the maximum and blue is the second largest. The sub-tables are associated with the images in Fig.1,2,3,4.

	First					Second				
Methods	EN	MI	$Q^{AB/F}$	AG	VIF	EN	MI	$Q^{AB/F}$	AG	VIF
Densefuse	6.0966	1.1246	0.2892	3.2526	0.2621	6.5332	2.3760	0.3573	2.4814	0.2260
FusionGan	6.0858	0.7382	0.3497	3.7335	0.1521	6.3126	1.7351	0.4855	3.4310	0.1799
GTF	6.5104	0.8598	0.4965	4.7915	0.1438	6.6015	2.1566	0.5612	4.2477	0.1871
VggML	6.1007	1.1250	0.2950	3.2755	0.2637	6.5430	2.3516	0.4012	2.6046	0.2306
DeepFuse	6.7478	1.1703	0.3784	5.0818	0.5419	7.0665	2.3879	0.5380	3.5072	0.4366
ResNet-ZCA	6.1021	1.1294	0.2932	3.2682	0.2612	6.6056	2.4010	0.3741	2.5145	0.2267
ZFN-Nest	6.8934	1.1949	0.4445	4.3867	0.4969	7.0883	2.1859	0.4098	2.5929	0.3772
MDFN	**6.9355**	**3.4869**	**0.5239**	**4.8803**	0.3009	**7.3156**	**4.1386**	**0.5523**	**3.5930**	0.2518
	Third					Fourth				
Densefuse	6.5394	2.0150	0.3304	2.2400	0.2581	6.5398	2.6733	0.3699	5.1283	0.2063
FusionGan	6.4807	1.6571	0.4010	2.9800	0.2085	6.5219	1.6420	0.5397	7.3303	0.1668
GTF	6.6217	2.0167	0.4866	3.5709	0.1731	6.7781	1.5464	0.5836	8.8087	0.1260
VggML	6.5451	2.0145	0.3598	2.3278	0.2629	6.5654	2.5981	0.4201	5.3905	0.2140
DeepFuse	6.8117	2.0207	0.4086	2.6215	0.3623	7.3685	2.7915	0.5805	9.0213	0.5054
ResNet-ZCA	6.5586	1.9558	0.3453	2.2765	0.2634	6.5495	2.6853	0.3765	5.1578	0.2078
ZFN-Nest	6.9501	1.9036	0.3774	2.4102	0.3881	7.4783	2.5825	0.5431	7.4337	0.4205
MDFN	**7.3510**	**4.5420**	**0.5319**	**3.2522**	0.2952	**7.4401**	**4.3299**	**0.6107**	8.3164	0.3030