\subsection{Introduction}

The paper addresses challenges and improvements with the Plug-and-Play Alternating Direction Method of Multiplier algorithm(ADMM), which is widely used for solving constrained optimization problems in image restoration. The paper provides step to step guidance, for us to know how plug-and-play ADMM comes from. Start with maximum-a-posteriori(MAP), standard optimization algorithms, Alternating Direction Method of Multiplier algorithm(ADMM), augmented Lagrangian function, and finally denoising algorithm.

\subsection{Challenges of Plug-and-Play ADMM}

There are several challenges this paper is focusing on. First, convergence of the algorithm, Classical ADMM require g to be closed, proper and convex in order to ensure convergence. However, for general image denoising algorithm, the convergence is not known. Conclusion first, this paper have a new algorithm that is guaranteed to converge for a broader class of denoisers.

Second, the implementation of plug-and-play ADMM. The challenge is to obtain a fast solver for the inversion step in x^(k+1) = argmin f(x) + pi/2 …….(5). Conclusion first, this paper has demonstrated a fast implementation.

\subsection{Comparison with related work}

Approximate message passing (AMP) algorithm is the algorithm replace the shrinkage step of the standard AMP algorithm in the class of “proper denoisers”. AMP was reported around the same period of time of Plug-and-Play ADMM. However, compare to Plug-and-Play ADMM, if f(x) departs from quadratic or if A is not random, then the behavior of the denoise-AMP becomes unclear. The paper also compare Plug-and-Play ADMM with algorithm such as BM3D, the conclusion is Plug-and-Play ADMM is more general than all the other algorithms mentioned in the paper.