Let $W_{DS} \in \mathbb{R}^{|V_{DS}| \times d_1}$ and $W_G \in \mathbb{R}^{|V_G| \times d_2}$ be the domain specific and generic word embedding matrices.
Let $w_{i,DS}$ and $w_{i,G}$ be the embedding of the word i $\in \mathrm{V}_\cap = \mathrm{V}_{DS} \cap \mathrm{V}_G$
Let ϕ_{DS} and ϕ_G be the projection directions of $w_{i,DS}$ and $w_{i,G}$, respectively.

For each embedding of each word, we will project it like so (the ϕ's are like the a and b in the CCA tutorial):

$$\overline{w}_{i,DS} = w_{i,DS}\ \phi_{DS} \text{ and } \overline{w}_{i,G} = w_{i,G}\ \phi_G$$

and we'll maximize the correlation of this projection like so:

$$\rho(\phi_{DS}, \phi_G) = \max \frac{\mathbb{E}[< \overline{w}_{i,DS}, \overline{w}_{i,G} >]}{\sqrt{\mathbb{E}[\overline{w}_{i,DS}^2]\ \mathbb{E}[\overline{w}_{i,G}^2]}}$$

We can repeat this process up to d = min(d_1, d_2) times, such that each canonical variable is uncorrelated with the previous ones.

Once we do that, we have two matrices of projection vectors: $\boldsymbol{\phi}_{DS} \in \mathbb{R}^{d_1 \times d}$ and $\boldsymbol{\phi}_G \in \mathbb{R}^{d_2 \times d}$

Finally, for a particular word i, we achieve its domain-adapted word embedding like so:

$$w_{i,DA} = \frac{1}{2} w_{i,DS}\ \boldsymbol{\phi}_{DS} + \frac{1}{2} w_{i,G}\ \boldsymbol{\phi}_G$$