Algorithm 1 ID-GNN with Question Answering

Input:Graph(V;E), input node features $\{\mathrm{x}_v \,|\forall\, v \in V\}$, *input qa node feature* $\{x_{qa}\,|\forall\, qa \in V\}$, *input edge feature* $\{f_{uv}\,|\forall e_{uv} \in E\}$; *Number of layers* K; *trainable function* $MSG_1^{(k)}(\cdot)$ *for nodes without identity coloring*,$MSG_0^{(k)}$ $(\cdot)$ *for the rest of nodes*; *edge encoder is* 2 *layer MLP*; *context score is* $LM(x_{qa})$; $EGO(v,k)$ *extracts the* $k-$*hop ego network centered at node* v, *in dicator fuction* $1[s=v]=1\, if\, s=v\, else\, 0$; u_s *and* u_t *are a node type*, e_{st} *is a edge relation type*; *The triplets is represented as a concatenated vector*

Output:QA score is the sum of the **context score** and the **graph score**

$\mathrm{f}_{su} \leftarrow$ *edge_encoder*(**concat**$[u_s, e_{su}, u_u]$)
x_v, $x_{qa} \leftarrow [1]$
for $v \in V$ **do**
    node_emb_list=[]
    k$\leftarrow$ 3
    $\mathrm{x}_v^+[k] = Diag(A^{[k]})[v]$
    $\mathrm{h}_v = concat[x_v\,,\, x_v^+]$
    $h_v \leftarrow h_v^{(K)}$
    node_emb_list.append(h_v)
end for
$h_{qa} \leftarrow fc(LM(x_{qa}))$
$QA\, score \leftarrow h_{qa} + SUM(node\_emb\_list)$

Algorithm 2 Game Theory Controller

for Every time step **do**
    Calculate target seeking command $\mathbf{x}_{tsCmd}$ (Eq.: 3.12)
    for All map measurements from $\mathbf{x}_{Map}$ **do**
        Denormalize measurement (Eq.: 3.14)
        Add margin of safety (Eq.: 3.15)
        Calculate altitude difference $\Delta h_{ObsSafe_j}$ to aircraft (Eq.: 3.16)
        if $\Delta h_{ObsSafe_j} > 0$ **then**
            Add measurement to set of critical measurements $\mathcal{M}_{crit}$ (Eq.: 3.17)
        end if
    end for
    for All measurements in $\mathcal{M}_{crit}$ **do**
        Calculate local obstacle avoidance vector (Eq.: 3.20)
    end for
    Sum over all local avoidance vectors (Eq.: 3.22)
    Transform to global coordinate frame to receive $\mathbf{x}_{oaCmd}$ (Eq.: 3.23)
    Calculate obstacle avoidance weight w_{oa} based on critical zone weight (Eq.: 3.24)
    Calculate target seeking weight w_{ts} as $1 - w_{oa}$ (Eq.: 3.13)
    Calculate command vector $\mathbf{x}_{HSaCmd} = w_{oa}\mathbf{x}_{oaCmd} + w_{ts}\mathbf{x}_{tsCmd}$ (Eq.: 3.11)
end for