《自生成兵棋 AI: 基于大语言模型的双层 Agent 任务规划》附录

附录 A 大语言模型提示

图表 A1 显示了战略 Agent 的反馈响应结果。图表 A2 显示了战术 Agent 的反馈响应结果。

Strategic Agent:

Red tank 1 Move_to: 16, 14 Reason: Tank 1 is moved from the closest corner to the target, while avoiding the direct attack of blue tank 2.

Red tank 2 Move_to: 17, 17 Reason: Tank 2 is moved as close to the target as possible while avoiding the possible fire range of blue tanks 2 and 10.

Red tank 3 Move_to: 18, 19 Reason: Tank 3 is moved towards the target position, trying to stay out of the range of blue tanks 2 and 10.

Red tank 4 Move_to: 15, 17 Reason: Tank 4 is moved to a location that can fend off the firepower of blue tanks 2 and 10 and quickly reach the target when needed.

Red tank 5 Move_to: 16, 19 Reason: Tank 5 is trying to get close to the target, while maintaining a safe distance to avoid the firepower of blue tanks 2 and 10.

Red tank 6 Move_to: 17, 19 Reason: Tank 6 is heading towards the target, keeping a distance as much as possible to avoid the firepower of blue tanks 2 and 10.

Red tank 7 Move_to: 16, 17 Reason: Tank 7 is maintained in a good position towards the target, keeping itself out of the direct range of blue tanks 2 and 10.

Red tank 8 Move_to: 19, 18 Reason: Tank 8 is moved towards the target, trying to stay out of the range of blue tanks 2 and 10.

Red tank 9 Move_to: 20, 17 Reason: Tank 9 is moving forward to the target, avoiding the fire range of blue tanks 2 and 10. Red tank 10 Move_to: 20, 16 Reason: Tank 10 is trying to get as close to the target as possible, keeping a safe distance to avoid the firepower of blue tanks 2 and 10.

These moves aim to position each tank towards the target point and to keep each tank at as varied locations as possible to avoid the concentrated firepower from the blue team. This strategy aims to get the tanks to the target point as quickly as possible and to avoid enemy firepower where possible.

图 A1 战略 Agent 提示反馈显示

Tactical Agent:

As Red tank 1, the command "Red tank 1 Hide" given by the command center seems somewhat unreasonable from my perspective.

"Hide" implies that I should avoid blue tank 2's attacks, which may lead to distancing myself from the target control point. As an attacking force, my priority should be to approach the target and engage in combat at the right moment, rather than evading the battle.

My ultimate goal is to capture control point [12, 24], and currently, blue tank 2 (located at [16, 40]) is closer to the control point. If I choose to hide, it will further increase the distance between me and the target, which is not conducive to reaching the objective quickly.

In the last step, blue tank 5, 7, and 8 launched indirect attacks at [17, 7], and blue tank 10 also moved near [17, 41]. Given that blue tank 5, 7, and 8 launched indirect attacks, I have reason to believe that the area around [17, 7] might not be the position of blue tank 2. Therefore, avoiding direct confrontation with blue tank 2 is not the most urgent task at the moment.

In conclusion, from my perspective, I believe that "Red tank 1 Hide" is not the most reasonable command. Instead, I should choose to advance towards the control point [12, 24], adopt a suitable strategy to avoid direct engagement with blue tank 2, and consider how to coordinate with the movements of other friendly tanks to achieve victory.

图 A2 战术 Agent 提示反馈显示

附录 B 专业领域知识文件

本文将专业领域知识文档输入到 GWA 算法中,形成 GWAE 算法。文件链接: https://gitee.com/sunyx926/wargame/blob/master/Prior%20Knowledge(1).pdf

附录 C 兵棋的主要规则设计

① 机动:智能算法向算子发送机动或停止命令,为算子指定机动路线。系统根据该机动路线自动变更算子的机动路径。② 通视判断:通视以六角格为单位计算,目标若出现观察距离内,会自动显示在态势中。③ 观察:系统每 1 秒更新一次态势信息,同步更新双方算子的位置,算子自动获取新的态势信息并输入到强化学习算法中。④ 射击:算子可对在可视范围内和武器射程内的目标进行间瞄或直瞄射击。直瞄射击规则见表 C1。

胜负判定:每局推演完毕后,一方将获得任务完成得分,然后根据双方的总得分确定胜负结果得分(失分和打击得分)。参数用于调整"任务分"项和"战果分"项的占比,直接影响算法效果和胜率高低。"任务分"项占比更高时胜率高,"战果分"项占比更高时战损比高。现有研究偏向于将胜率视为最重要的评价因素,故对"任务分"项设置更高比重。

规则条数	—————————————————————————————————————
规则 1	射击前在全局中按照通视规则判断能否射击
规则 2	坦克最远射击距离为8格,每回合按棋子轮流直瞄射击
规则 3	距离: 影响等级{1-5:3 6-8:2}
规则 4	如果目标高程相差>=40,随机等级:攻击方-3,防守方
	+2; >=30,攻击方-2,防守方+1; >=20,>=10,攻击方-1
规则 5	如果防守方在森林中,则攻击方随机数-2
规则 6	特殊地形,周围有四处屏障时攻击方一侧的随机数-1

表 C1 直瞄射击规则

附录 D 战术 Agent 使用 GPT-3.5 LLM 和 GPT-4 LLM 测试样本文件

本文将测试样本中的兵棋算子信息分别输入到 GPT-3.5 LLM 和 GPT-4 LLM 中,测试两者的差异。文件链接:

https://gitee.com/sunyx926/wargame/blob/master/%E6%88%98%E6%9C%AFAgent%E4%BD %BF%E7%94%A8GPT-3.5%20LLM%E5%92%8CGPT-4%20LLM%E6%B5%8B%E8%AF%95%E6% A0%B7%E6%9C%AC.pdf

附录 F 实验补充说明

- 2. 本文所使用的有关 ChatGPT 实验,是作者在 2023 年英国访学交流期间完成的。