



De La Salle University
Department of Software Technology

CCDSTRU Project Specifications

Term 2, AY 2023–2024

Due: **Apr 1, 2024 (M) before 0800**

Implement a computer program (either in C or Java) following the specifications of the system given below.

Applicable Sets

$$\mathbf{U} : \{x \in \mathbf{Z}^+ \mid x < 3\}$$

$$\mathbf{T} : \{x \in \mathbf{Z}^+ \mid x < 7\}$$

$$\mathbf{C} : \mathbf{U} \times \mathbf{U}$$

$$\mathbf{F} : \mathbf{T} \times \mathbf{T}$$

$$\mathbf{V} : \{\text{true}, \text{false}\}$$

$$\mathbf{P} : \{\{(1, 1), (2, 2)\}, \{(1, 2), (2, 1)\}\}$$

$$\mathbf{S} : \{\{(1, 1), (1, 3), (2, 2), (3, 1), (3, 3)\},$$

$$\{(4, 4), (4, 6), (5, 5), (6, 4), (6, 6)\},$$

$$\{(1, 5), (2, 4), (2, 5), (2, 6), (3, 5)\},$$

$$\{(4, 1), (4, 3), (5, 1), (5, 3), (6, 1), (6, 3)\}\}$$

System Variables

$$good \in \mathbf{V}$$

$$C_1, C_2 \subseteq \mathbf{C}$$

$$over \in \mathbf{V}$$

$$F_1, F_2, F_3 \subseteq \mathbf{F}$$

$$next \in \mathbf{V}$$

System Facts

$$F_3 = \mathbf{F} - (F_1 \cup F_2)$$

$$over \leftrightarrow ((|F_3| = 0) \vee \exists x (x \in \mathcal{P}(C_1) \wedge |x| > 0 \wedge x \in \mathbf{P}) \vee \exists x (x \in \mathcal{P}(C_2) \wedge |x| > 0 \wedge x \in \mathbf{P}))$$

System Initialization

$$good = \text{false}$$

$$next = \text{false}$$

$$C_1 = \emptyset$$

$$C_2 = \emptyset$$

$$F_1 = \emptyset$$

$$F_2 = \emptyset$$

System States and Behavior

NextPlayerMove($pos \in \mathbf{F}$)

$$(a, b) = pos$$

$$c = \lfloor \frac{a-1}{3} \rfloor + 1$$

$$d = \lfloor \frac{b-1}{3} \rfloor + 1$$

$$(\neg over \wedge next \wedge pos \in F_3) \rightarrow (good = \neg good \wedge F_1 = F_1 \cup \{pos\})$$

$$(\neg over \wedge \neg next \wedge pos \in F_3) \rightarrow (good = \neg good \wedge F_2 = F_2 \cup \{pos\})$$

$$(\neg over \wedge good \wedge next \wedge |\mathcal{P}(F_1) \cap \mathbf{S}| > |C_1|) \rightarrow C_1 = C_1 \cup \{(c, d)\}$$

$$(\neg over \wedge good \wedge \neg next \wedge |\mathcal{P}(F_2) \cap \mathbf{S}| > |C_2|) \rightarrow C_2 = C_2 \cup \{(c, d)\}$$

$$(\neg over \wedge good) \rightarrow good = \neg good$$

GameOver($over$)

$$result \in \{\text{"B wins"}, \text{"A wins"}\}$$

$$(over \wedge next \wedge \exists x (x \in \mathcal{P}(C_1) \wedge |x| > 0 \wedge x \in \mathbf{P})) \rightarrow result = \text{"A wins"}$$

$$(over \wedge \neg next \wedge \exists x (x \in \mathcal{P}(C_2) \wedge |x| > 0 \wedge x \in \mathbf{P})) \rightarrow result = \text{"B wins"}$$

$$\neg over \rightarrow (next = \neg next)$$