Appendix A

(‘490 Patent)

Element	The '490 Patent	Presence of each limitation in JP11-212642 ("Ueno")
1[a]	A mobile robot comprising:	Ueno describes a method and device for controlling a self-propelled robot that can travel exhaustively over a given area in as short a time as possible. *See* Ueno at ¶ [0001] and Figs. 1, 2, and 3.
1[b]	means for moving the robot over a surface;	The robot 1 is moved forward, backward, and stopped over a given area by the wheels 3, 4 that are driven by separate motors. *Id.* at ¶¶ [0001], [0015], and Figs. 2 and 3.
1[c]	an obstacle detection sensor;	A plurality of infrared sensors for detecting boundaries and obstacles in a noncontact manner are included in the robot 1. For example, sensors 26R and 26L are disposed in front of the robot 1 in an advancing direction, sensors 26MR and 26ML are disposed in a slanted front direction, and sensors 26RR and 26RL are respectively disposed in a rear direction. The letter R is for obstacle detection on the right side with respect to the travel direction and the letter L is for obstacle detection on the left side with respect to the travel direction. *Id.* at ¶ [0016] and Figs. 2 and 3. Although the sensors are preferably infrared sensors, any type of sensor such as an ultrasonic sensor or other optical sensor can be used as a proximity sensor capable of detecting an obstacle within a planned short

		distance. *Id.* at ¶ [0017].
1[d]	and a control system operatively connected to said obstacle detection sensor and said means for moving;	FIGs. 1 and 16 are block diagrams showing hardware configurations of devices for controlling a self-propelled robot. The hardware configurations include a control device 7 including a CPU 8. *Id.* at ¶¶ [0007], [0018], and Figs. 1 and 16. The control device 7, as illustrated in Fig. 1, is connected to drive motors 14 and 15, left and right brakes 12 and 13 and sensors 25L and 26. *Id.* at ¶¶ [0018],[0020], and Figs. 1 and 16. CPU 8 controls the operations of the drive systems such as the right and left motors 14 and 15 and right and left brakes 12 and 13. Specifically, based on contact information from the sensors 25L and 26 and the contact sensor 5A, the CPU 8 controls the drive system operations of the right and left motors 14 and 15. *Id.* at ¶¶ [0007], [0019], and [0020].
1[e]	said control system configured to operate the robot in a plurality of operational modes and to select from among the plurality of modes in real time in response to signals generated by the obstacle detection sensor	"Based on the information from a pair of multiple ultrasonic sensors 6 positioned oriented toward front, right and left side surfaces and slanting -front direction etc, contact sensor 5A positioned on front end bumper etc, rotation number sensor 10 of right and left wheels, CPU 8 controls the operations of right and left wheel drive motors 14, 15,

		right and left brakes 12, 13 etc, enabling the robot to execute each operation of moving forward, retreat, stopping and ultra-pivot turn, pivot turn, rapid turn and slow turn." *Id.* at ¶ [0007]. "[B]ased on the proximity and contact information from sensors 25L, 26 and a contact sensor 5A (hereinafter called [sensors] collectively), CPU 8 decides the drive system operations of left and right wheel drive motors 14, 15 etc." *Id.* at ¶ [0020]. Ueno discloses three travel modes: spiral, random, and border-following. *Id.* at ¶¶ [0014] and [0035]. These modes occur in real time because they occur in reaction to the sensors. For example, ¶ [0052] discloses that the travel mode and travel parameters to be executed are determined "based on the detection result of the proximity sensors provided on the front and side of the robot respectively." Ueno also discloses that border-following travel (following the wall to correspond to the claimed "obstacle following mode") starts when the side sensor 25L detects a boundary such as a wall during execution of the random travel or spiral travel modes (the claimed "bounce" and "spot-coverage" modes). *Id.* at

		¶[0023]. Ueno also discloses that the spiral travel is switched to the random travel mode based on detecting an obstacle (wall or boundary). *Id.* at ¶¶[0005], [0028] and Fig. 6. Further, Ueno describes switching to a spiral travel mode after the robot 1 has turned back a preset number of times because of the detection of a wall surface during a random travel mode. *Id.* at ¶ [0030].
1[f]	said plurality of operational modes comprising: a spot-coverage mode whereby the robot operates in an isolated area,	Fig. 6 illustrates a spiral travel mode. "Here, in order not to make space in a travel trajectory, the speed of left and right wheels 3, 4, that is, the rotation speed of each wheel drive motor 14, 15 is calculated and by updating these speeds, the rotation radius is gradually increased. A spiral gets bigger and based on the output of sensors 26 and 25L, when it is recognized that the robot 1 approached within the planned distance with respect to the wall surface B, the spiral travel is stopped and a random travel is started to move to the next spiral travel start position[.]" *Id.* at ¶[0028]; *see also id.*at ¶ [0027] and Fig. 6.
1[g]	an obstacle following mode whereby said robot travels adjacent to an obstacle,	Ueno describes that the robot includes a border-following travel pattern when a side sensor 25L detects a boundary such as a wall. *Id.* at ¶ [0023] and Fig. 4. Specifically, Ueno describes that when the

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