Homework 10: Patent Liability Analysis

Team Code Name:  Autonomous Targeting Vehicle (ATV)  Group No.  3
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Evaluation:

<table>
<thead>
<tr>
<th>SCORE</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>10</td>
<td>Excellent – among the best papers submitted for this assignment. Very few corrections needed for version submitted in Final Report.</td>
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<tr>
<td>8</td>
<td>Good – all requirements considered and addressed. Several noteworthy additions/corrections needed for version submitted in Final Report.</td>
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<tr>
<td>7</td>
<td>Average – all requirements basically met, but some revisions in content should be made for the version submitted in the Final Report.</td>
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<tr>
<td>6</td>
<td>Marginal – all requirements met at a nominal level. Significant revisions in content should be made for the version submitted in the Final Report.</td>
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<td>*</td>
<td>Below the passing threshold – major revisions required to meet report requirements at a nominal level. Revise and resubmit.</td>
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* Resubmissions are due within one week of the date of return, and will be awarded a score of “6” provided all report requirements have been met at a nominal level.

Comments:
1.0 Introduction

The Autonomous Targeting Vehicle (ATV) is a mobile robot that is designed to autonomously travel to user specified locations, avoiding obstacles along the way. The vehicle will determine its proximity to surrounding objects using two infrared range finders, and a single sonic range finder. It will visually track objects using a webcam, allowing the user to maintain visual contact with the target. In the absence of a GPS signal, the user will click an object in the webcam view to instruct the vehicle where to travel next. Because the GPS coordinates are only accurate to 10 meters, the robot will utilize a Kalman filter for “dead reckoning” its position based on sensor data from an accelerometer, a compass, and wheel encoders. A graphical user interface will show the user the path the robot travels to get to its destination using a screenshot from Google Maps.

Several features of the ATV have the possibility of patent infringement. The features to consider are the method of autonomous movement using range finders for obstacle avoidance, the vision assisted navigation, the method of “dead reckoning” using a Kalman filter from sensor data, and the use of a Google Maps screenshot. This document will discuss a few patents that are very similar to the ATV, an analysis of how the ATV is different or similar to said patents, and recommended actions for avoiding legal issues.

2.0 Results of Patent and Product Search

Several patents were searched for operations and methods of mobile robots that are similar in functionality to the ATV. Patents of interest dealt with autonomous robotic vehicles, object avoidance capabilities, robotic systems with vision integrated performance, and robotic systems with “dead reckoning” capabilities. The issue with Google Maps copyright infringement was also researched. The following four patents/copyrights are closely related with the features mentioned above in section 1.0:

2.1 United States Patent 6515614, filed on October 11, 2001: Autonomous moving apparatus having obstacle avoidance function [1]. This patent concerns an autonomous moving apparatus that moves toward a destination while detecting and avoiding obstacles using a horizontal plane scanning radar device to detect a position of an obstacle, and an obstacle sensor for detecting an obstacle in a space different from the scanning plane of the radar
device [1]. The patent has many claims that are relevant to the ATV. The non-scan type sensor is a set of supersonic sensors, arranged in a semi-circular shaped area and synchronized through supersonic-wave oscillation timing settings, or an optical sensor that detects objects based on light reflections [1]. When an obstacle is detected, the controller decreases traveling speed, and is only permitted to be a certain distance from the object [1]. When an obstacle is detected, the controller changes the direction of the apparatus until no obstacle is detected, and resumes movement [1]. The apparatus also utilizes a specific-configuration detecting element for detecting the presence of an object having a specific configuration, and uses the scan-type sensor to determine changes in movement of that object [1].

2.2 United States Patent 7817847, filed on October 5, 2005: Robot system with vision sensor [2]. This patent concerns a robot system having a vision center that obtains image data of a working environment of the robot. The major claim consists of a system that includes a section for controlling the robot, an imaging section for obtaining image data on the working environment of the robot, an image processing section, a vision controlling section to obtain, transmit, and process the data, and a communication network to which all networks are connected [2]. The robot also has a vision controlling section that makes the imaging section obtain image data at predetermined time intervals and displays the image data as a moving image [2]. The robot controlling section works to control the robot in accordance to a work program, and performs position correction based on position data retrieved from the imaging section [2].

2.3 United States Patent Application 20070118248, filed on October 17, 2006: Method and apparatus for reckoning position of moving robot [3]. This application concerns a method and apparatus for reckoning a position of a moving robot using dead reckoning and range sensing. As mentioned in the claims, the robot reckons its position by performing dead reckoning to determine a variation state, determining absolute position by measuring its distance from a fixed object, and predicting an optimized current position of the moving robot using the variation state and absolute position [3]. It uses an encoder and/or gyroscope to perform dead reckoning, and determines its fixed position using at least one fixed position
in a charge station of the moving robot and another fixed position [3]. Radio waves are used in determining distance to the fixed locations [3]. A Kalman filter calculates the current state using the variation state and absolute position, using information from an auxiliary sensor, which comprises at least one of a nearby obstacle sensor, a laser sensor, a distance sensor, and a camera [3].

2.4 The last case of infringement involves Google Maps. Permission guidelines regarding specific use cases for Google Maps are as follows: “all use of Google Maps and Google Earth and Content MUST provide attribution to Google and our suppliers [4].” Content cannot be scraped or exported from Google Maps or Earth or be saved for offline use [4].

3.0 Analysis of Patent Liability

Of the three patents found for which the ATV has the possibility of infringing, one is literally infringed, one has the possibility of being infringed under the Doctrine of Equivalents, and one has no issues of infringement. For the Google Copyright, the ATV directly violates the copyright. The analysis to follow will explain how the functions performed by the ATV are similar and/or different from those of the patents/copyrights identified in section 2.0.

3.1 The ATV performs exactly the same function as U.S. Patent 6515614 [1], but achieves the functionality in a much different way. The mobile apparatus of this patent detects obstacles using a scanning radar device, that scans the horizontal plane for objects, and a non-scan type obstacle sensor, which is described to be an optical sensor, or a set of supersonic sensors arranged in a semi-circular shaped obstacle detection area in a horizontal plane in a traveling direction [1]. The ATV detects obstacles using two infrared proximity sensors and a single ultra-sonic range finder. None of the sensors operate as a scan-type sensor, and the collection of sensors is not arranged in the same fashion as the non-scan sensors of the apparatus described in the patent. The major similarities are with the methods of controlling the autonomous apparatus. The patent describes an apparatus that decelerates as it nears an object, and slowly turns until an object is no longer detected. The ATV operates the same way, however this method of avoiding objects appears rather obvious. The ATV does not include a specific-configuration detection method, whereas the patent does. Because of the
major differences in the methods of detecting objects and the lack of a specific-configuration detection mechanism, there is no concern for infringement of this patent.

3.2 U.S. Patent 7817847 describes a robotic system with a vision sensor. The mechanism it uses to achieve this functionality is a control section, imaging section, image processing section, vision controlling section, and a communication network that connects all the aforementioned sections [2]. Because the patent is written in such vague context, it appears that the ATV will be in violation of this patent. The ATV includes a control section (microcontrollers / Atom board), an imaging section and image processing section (second microcontroller / Atom board), vision controlling section (Atom board), and a communication network (PCB). The function of this patent is accomplished using the same mechanism as the ATV, therefore literally infringing this patent. However, because of the vague nature of the patent, it may not hold up in court.

3.3 U.S. Patent Application 20070118248 describes a method and apparatus for reckoning the position of a moving robot. The method mentioned in the application includes dead reckoning using a Kalman filter to determine a variation state, determining its distance from a fixed object to determine its absolute position, and an encoder and/or gyroscope along with an auxiliary sensor to assist in the dead reckoning calculations [3]. The ATV will utilize a compass, an accelerometer, and two wheel encoders to perform the necessary calculations using a Kalman filter. The sensors used for each method are similar, however the ATV uses a compass and accelerometer, where the patent uses strictly a gyroscope. The major difference between the patent and the ATV is that the robot in the patent uses a fixed object to determine its absolute position, whereas the ATV will use a GPS signal to determine its approximate current location. If this patent is granted, the ATV will possibly infringe upon the Doctrine of Equivalents.

3.4 The ATV directly violates the usage terms of Content from Google Maps [4]. Google specifically states that Content from Google Maps cannot be exported or saved for offline use [4]. The graphical user interface for communicating with the mobile robot (ATV) uses a screenshot from Google Maps to display location and path information for the user to see.
4.0 Action Recommended

Of the three patents and one copyright that were found to be similar in functionality to the ATV, only two of the patents, along with the copyright, are of concern for some sort of infringement. The ATV implements the mechanism described in patent one [1] in a much different fashion, eliminating the case for infringement. Patent two [2] is worded so vaguely that it doesn’t appear as if there is any way to work around the infringing function without completely removing the vision aspect from the ATV. This is not ideal, as the vision aspect is an integral part of the project. In order to eliminate the literal infringement of this patent, we would try to have the patent nullified on the basis of being obvious. If this tactic would not work, the only option would be to license the patent. As for the patent application [3], a patent lawyer would be contacted if the application were granted. The ATV would have to license the patent if necessary to avoid infringement under the Doctrine of Equivalents. Because the ATV utilizes an image (map) of the surrounding area, the only option for dealing with the copyright infringement with Google Maps [4] would be to license the image. For future expandability, a Google API could be integrated into the system and be used for displaying maps of various areas, which would completely remove the case for infringement.

5.0 Summary

The main features of the Autonomous Targeting Vehicle include autonomous movement using range finders for obstacle avoidance, vision assisted navigation, a method for “dead-reckoning” that involves using a Kalman filter from sensor data, and a graphical user interface that displays a screenshot from Google Maps. Three patents and one copyright were found that were relevant to the functionality of the ATV. The ATV literally infringes upon U.S. patent 6515614, and possibly infringes upon the Doctrine of Equivalents for U.S. patent application 20070118248. U.S. patent 7817847 is of no concern for any type of patent infringement. If U.S. patent 6515614 cannot be successfully nullified, licensing the patent is the only option. If patent application 20070118248 were granted and the ATV infringed it under the Doctrine of Equivalents, it would be licensed accordingly. As for the Google Maps copyright, the image obtained from Google Maps could be licensed, or the ATV’s user interface could be expanded to use one of Google’s API’s, eliminating the case for infringement.
List of References


