

# **Angle & Force Controlled Prodding**

Smitha Raghunathan  
Helen Tsai

Instructors: Benjamin Linder & Andrew Heafitz  
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## 1.0 Introduction

This report is intended to show the preliminary research and considerations we took in the development of an Angle & Force Controlled Prodding (AFCP) tool. This project was explored in conjunction with the *MagRake* product, and only *MagRake* was pursued in greater detail to the end of the semester. However, we did make significant progress in the concept development of an AFCP tool.

The need for this product stems from the training time for proper prodding technique and the disregard of this training when in the field. This tool would act as a constant training reminder via auditory, visual or physical reminders of proper prodding procedure. Additionally, this would allow a monitoring manager to note which deminers keep with proper procedure, and which ones ignore it.

## 2.0 Design

The product we considered would have to be extremely economical, as conventional prodders have negligible cost to demining organizations. Therefore, the designs we explored to control angle and force were simple mechanical indicators, implementing no electronics (which would significantly boost cost).

One possible solution for monitoring force application would be the use of a spring placed in the barrel of the prod; once this spring was compressed a certain distance (corresponding to a specified application of force to the ground by the user) a simple bicycle bell could be rung, notifying the user of his dangerous actions. Additionally, the bell would also serve as an auditory cue to a manager of a break in procedure.

There were several offered solutions to the problem of angle maintenance while prodding. First was the creation of a prodding platform made of thermoformed plastic that would serve as a guide for use. This would most likely be used in a training environment rather than in the field. However, there are possibilities for field use by coupling this platform with a blast shield or a knee pad. Another, more field-applicable solution to this problem was a similar auditory cue for misconduct as the force sensor. A ball placed at the transition of the handle to metal probe would maintain its position at that location until the handle was turned past a safe  $30^{\circ}$  orientation. At that time, the ball (made of some metal) would roll towards the end of the handle where it would impact a hollowed out shell of metal. This would act as the hammer and bell, creating a sound to indicate dangerous angle of use. The nature of this solution would offer auditory warning only if the deminer used the prod at a dangerous angle for more than a moment. This would prevent unnecessary warnings for short breaches in protocol. Also, the ball rolling within the handle would cause a subtle shift in the center of mass of the tool, thereby warning the user in a physical as well as auditory manner.

There are many simple mechanical solutions to these problems that we have undoubtedly overlooked, and we are sure that some of these resolutions will one day lead to a product that will strongly impact the demining community.

### 3.0 Future Work

One of the major issues to be addressed with this product is the demining community's receptiveness to the idea. The main reason this product was not pursued over the *MagRake* was because we could not find a sponsor in demining community that advocated the pursuit of this idea. This needs to be addressed, and it is important to find someone with experience in demining and its organizations who likes the idea of controlling angle and force of prodding in a cheap, effective manner.

Another issue is whether to focus the product on training or in the field. We believe there are possibilities in each area, but a strong case for the development of this product can be made for use in the field. However, even if this product was not used in the field, the auditory and visual reminders of improper procedure would act as additional instructors in a training environment, facilitating better use of manpower and a faster learning process.

The final issue we considered was cost. The only way this product could be successful in the demining community is if its cost was comparable to current demining probes. This requires a very clever, low-cost, robust and reliable product. We feel this is within the grasp of students at MIT, and strongly recommend the pursuit of this product if an advocate in the demining community can be acquired.

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