



To apprehend or not to apprehend: A mathematical model for ending student strikes in a university



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ABSTRACT

A dynamic model for strike propagation in a university with constant admission once per year is developed. We control strikes by signing a no-strike commitment, stopping recruitment of demonstrators and expelling apprehended students. The model was analyzed and results show that enforcing signatures and expelling those who strike will curb strikes in universities. With saturation it could take about 23 hours before a strike breaks out after a grievance, while with self-limitation, the strike might never break out. Direct investment is the best strategy to control strikes, and despite varying intensity during a strike the dynamics remain the same.

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1. Introduction

A strike is a work stoppage caused by the mass refusal of employees to work. A strike usually takes place in response to employee grievances [1]. Student protest encompasses a wide range of activities that indicate dissatisfaction with a given political or academic issue and mobilization to communicate to authorities (university or civil or both) and society in general and hopefully remedy the problem. Protest forms include but are not limited to: sit-ins, occupations of university offices or buildings, strikes etc. A common tactic of student protest is to go on strike (sometimes called a boycott of classes), which occurs when students enrolled at a teaching institution such as a school, college or university refuse to go to class. Striking involves awesome moral, educational, and political decisions. A strike coerces those who wish to study to stay out (after they have paid for their education); it gives the impression that the entire university community is united in protest, which it may not be; it violates the contracts of the teachers and may even break state laws [2]. The purpose of these strikes is often to put pressure on the governing body of the university, particularly in countries where education is free, and the government cannot afford to have a student cohort miss an entire year. This can cause an overload of students in one academic term and the absence of an entire class in the following term.

In the West, student strikes date to the early days of universities in the middle ages, with one of the earliest and most significant being the University of Paris strike of 1229, which lasted two years and yielded significant concessions. In more recent times, significant walkouts occurred in the late 1960s and early 1970s: the French May 1968 uprisings began as a series of student strikes. The largest student strike/boycott in American history occurred in May and June 1970, in the aftermath of the American invasion of Cambodia and the killings of student protesters at Kent State University in Ohio. An

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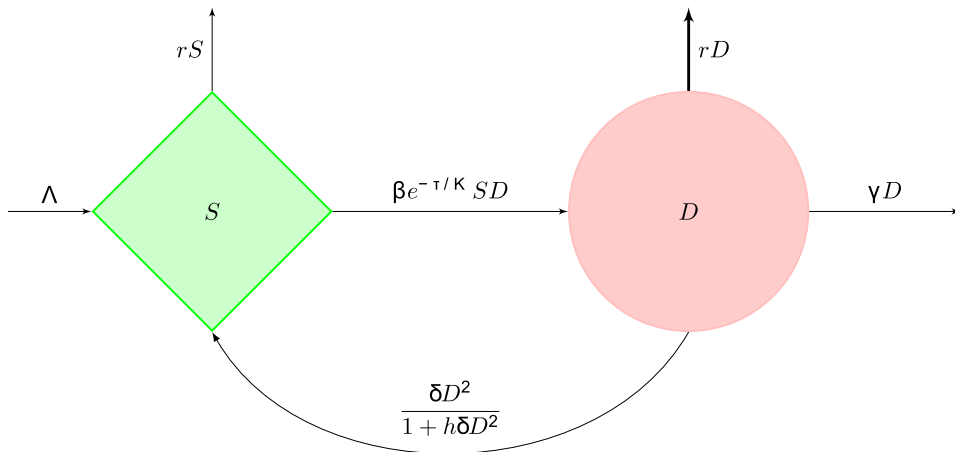


Fig. 1. A compartmentalized diagram for the dynamics of strike propagation.

estimated four million students at more than 450 universities, colleges and high schools participated in the Student Strike of 1970 [3,4]. The term “student strike” has been criticized as inaccurate by some unions [5] and commentators in the news media [6]. These groups have indicated that they believe the term boycott is more accurate [5,6].

In Uganda, there have been reports of student protests from various universities such as Nkumba [7], Ndejje [8], Kyambogo [9,10], Gulu [11,12], among others. In Makerere university student protests have become a norm. Makerere university has had its fair share of strikes [13–19]. Student protests are triggered by various grievances. For example in Nkumba, the 2008 hunger strike was a result of unfulfilled memorandum of understanding between students and the university senate in which the university had agreed to provide good sanitation, decent meals, a well-equipped library and improvements to the general academic environment [7]. This strike came after several serious strikes had happened at Makerere and Kyambogo universities respectively. Whereas student protests in other major universities have been results of various grievances, in Makerere University the most recurring reason is the tuition policy [13,14].

During such public display of grievances, anti-riot police are heavily deployed to forbid further offensive actions and riots [9,13–15]. Residents of Wandegaya, Kikoni and other surrounding areas of Makerere university have complained about students who destroy their property when they strike. They destroy cars belonging to people who neither work nor study at the university [20–22]. Although participation in strikes should be voluntary, students are forced to participate and beaten up if found in lecture rooms [20–22].

During such riots, students get injured and some have died due to activities during the violent strikes. There should be a way to curb these strikes. Strict laws on strikes in certain universities have worked for some institutions. Violence is not the only way to express disgruntlement. The question on everyone’s mind is why university students would resort to strikes as means of resolving an issue with administration. In presence of numerous peaceful conflict resolution tactics such as open dialogue and agreement on the way forward, the obvious question would be why violence is really necessary? In this paper, a model is designed to show how to curb strikes in a university. Boxes are used to sub group the students based on whether they would strike or not. Intervention measures are applied and explored to ascertain the overall effect of each used singly or in combination. To demonstrate the application of the model, we apply data from Makerere University.

2. Formulation of the model and analysis

We study strikes using general techniques of mathematical modelling [23–26], by dividing the students into two categories: those who are susceptible and can strike if convinced, S , and the demonstrators who recruit more students to join a strike D . Every year, the university admits on average 50,000 students on government and private programmes, degree or diplomas. This admission is denoted by Λ . Once in the university and in the event of a strike, demonstrating students can recruit susceptible students to join them at a rate β . When they start demonstrating, students can be apprehended by law enforcement at a rate δ , and may result into getting expelled from the university at rate γ (see Fig. 1). Holling type III functional response was used to model a demonstrator D returning to class S due to saturation at high levels of demonstrator density when they become prey to law enforcement. At low demonstration levels, the graphical relationship of the number of demonstrators apprehended and the density of the demonstrator population is a more than linearly increasing function of demonstrator apprehended by law enforcement, and often justified by learning time, demonstrator switching, or a combination of both phenomena.

The learning time is defined as the improvement by law enforcement in searching and attacking efficiency or in their handling efficiency as demonstrators’ density increases. If the demonstrators are very few, the chance of a law enforcer encountering them is extremely low– the law enforcer finds demonstrators so infrequently, and therefore has not had enough

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