

Bail Out

Time: 5:00pm, Friday, March 27, 2009 MARC Building Atrium

1. INTRODUCTION

Financial bailouts are all the rage these days. Every country seems to be throwing money (their children's money) at any company that can come up with a good story of impending doom. With all that money being thrown around, engineers should not be left out. Your task is to build a device to acquire money in a financial bail out. Your device will work within the financial arena shown in Figure 1. It will have 1 minute to perform the following three tasks:

1) Avoid the Repo Man. Two Repo Men will be stationed in each home zone. Your machine should try to keep them out of your zone. For each Repo Man left standing upright in your zone, you lose **\$10**. Each Repo Man that is knocked over and at least partially in your home zone will cost you **\$5**.

2) Deposit Monthly Salary.

You will be given 4 colored balls. If you can deposit them into the bank, then you will get **\$10** per ball. Access to the bank is periodically blocked by swindlers that rotate around the outside of the bank.

3) Earn Bonuses. Throughout the arena there will be stacks of cash and rare coins. For each big stack of money completely in your zone, you get **\$20**. Any big stack partially in your zone earns you **\$10**. Small stacks are worth **\$10** and **\$5**, respectively. The rare coins will be in the center, near the bank. Each coin fully in your zone earns **\$2**, shared coins earns **\$1**.

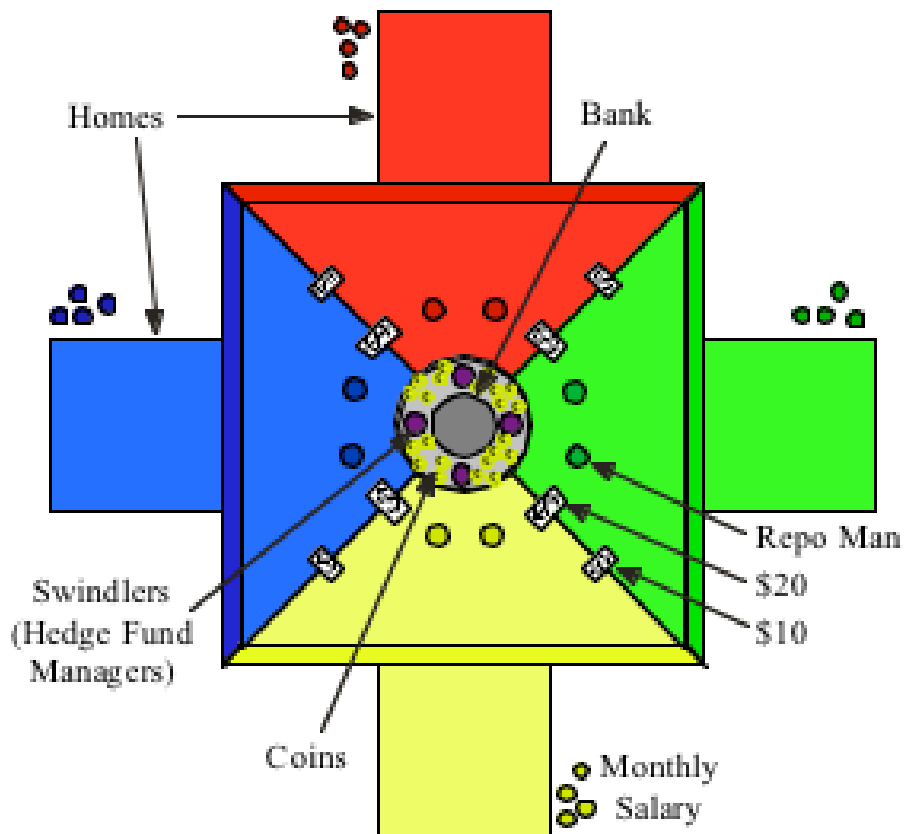


Figure 1: Financial Arena.

Your devices will be tested on five occasions:

1) Individual Test 1 (Week of Feb. 16)

All students will construct their own device for avoiding the Repo Man. The device will not be computer controlled. The only energy sources that can be used are gravity and 3 mousetraps. You will trigger the action of your machine by hand, but you cannot transfer any significant energy to the machine during the triggering process. Your device will compete by itself. You will have 5 minutes to run your machine at most three times. Your score will be the sum total of your three attempts. **One percent of your course grade comes from this test.**

2) Individual Test 2 (Week of Feb. 23)

The goal of this test is the same as the first test – avoid the Repo Man. However, other machines will be operating in the area, so they could drive their Repo Men into your zone. This could cost you a lot of money. Your machine will compete in 4 matches against a variety of opponents. **Two percent of your course grade comes from this test.**

3) Small Bail Out (Week of March 2)

This will be the first test for a machine constructed by your team. You can use the computer controller, the supplied actuators, pneumatics, gravity, and 5 mousetraps. Your machine will be evaluated on how well it **Avoids the Repo Man** and **Deposits Your Salary**. Your device must be triggered electronically. Your device will compete alone, without other machines. You will have 5 minutes to run your machine at most three times. Your score will be the sum total of your three attempts. Your performance will be ranked against all studios. **Two percent of your course grade comes from this test.**

4) Medium Bail Out (Week of March 9)

You will compete against other machines in all aspects of the bail out. You will compete several times during the studio period against a variety of opponents. Your score will be ranked only against teams in your studio section. **Two percent of your course grade comes from this test.**

5) The Big Bail Out (April 4)

a) Design Review: Starting at 5:00pm a panel of judges will perform a design review of your machine. You will need to describe your machine quickly and clearly to the judges. They will score your machine on aesthetics, ingenuity, and presentation. **Five percent of your course grade comes from this review.**

b) Big Bail Out: Each machine will compete two times. The top two machines in each test will be declared winners. All machines with at least 1 win in the first two rounds will proceed to the third round of tests. Only winners in the 3rd round will proceed to the 4th round, etc. **Seven percent of your course grade comes from this competition.**

2.3 Contest Format

From 5:00pm-6:00pm your devices will be on display in the MARC building for the design review. The design review score incorporates aesthetics, ingenuity, and presentation. You are allowed to "dress up" yourselves, your machine, and your presentation area in order to maximize your score. At least one team member will need to be in attendance during the design review to discuss the features of your machine. This will operate in a typical science fair type mode. There will be an award given for "Best in Show", which does not count towards your grade. The Big Bail Out tests begin at 6:15pm.

2.4 Details of Competition Scoring

Repo Man.

At the start of each test, two Repo Men will be in your zone. They are nominally a plastic bowling pin, but they may have faces painted on them and dressed up with arms, legs, clothes, etc. Each team will be given 1 bowling pin that they can convert to a Repo Man. No part of a Repo Man can extend out from the unmodified bowling pin by more than 3 inches. A Repo Man cannot weigh more than 1 lb. The Repo Man your team creates will be on display with your final machine at the design review. The Repo Men will then be collected and used at random times during the subsequent contests.

A Repo Man is considered standing if his centerline is within 10° of vertical. If **any part** of a Repo Man, such as an arm or leg is in your zone, then he collects from your team.

Depositing Salary.

You will be given 4 plastic balls that match the color of your home zone. If your machine can deposit 1 or more of the balls into the bank, then you will get **\$10** per deposit. A ball is considered deposited if any part of the ball is within the bank.

Earning Bonuses.

At the start of each test, big and small stacks of money will be placed on the dividing line between zones. The big stack is a full-sized PayDay candy bar, and the small stack is a "Fun Size" 100 Grand bar. If the bars are not moved, then each team shares the money. If they are moved, and part of the stacks are within your zone, then you share the money. Only if a stack is completely within your zone will you get all the money.

In the center of the arena, 10 coins will be placed between each of the 4 Swindlers. These coins are Rolo candies. Each coin that is retrieved into your zone earns you **\$2**. If a coin is straddling two zones, then each team gets **\$1**.

Tie Breaker Procedure.

In the case of a tie score, the following tiebreakers will be applied in order until one team is declared victorious. 1) The team with the most money from **Depositing Salary**. 2) The team with the most money from **PayDay Bars**. 3) The team with the most **Rolos**. 4) Coin toss.

The methods of earning are summarized in Table 1.

Table 1: Scoring Summary.

Activity	Point Value
Repo Man	-\$10 standing, -\$5 otherwise
Depositing Salary	\$10 for each deposit
PayDay Bars	\$20 fully earned, \$10 partial
100Grand Bars	\$10 fully earned, \$5 partial
Rolos	\$2 fully earned, \$1 partial

2.5 Grading

The performance of your machine composes 15% of your grade for the course and the design review counts for 5%. The 15% of your grade that comes from the performance of your machine is divided into five components, as shown in Table 2. Each of the areas listed will be described in detail.

Table 2: Grading Breakdown.

Maximum Points	Breakdown
1	Individual Test 1
2	Individual Test 2
2	Small Bail Out
2	Medium Bail Out
8	Big Bail Out

2.5.1 Individual Test 1: People owing \$0 after 3 tries will get 1 full point. People owing \$30 (the worst case), will get 0 points. All other scores come from a linear interpolation between these values.

2.5.2 Individual Test 2: Your score will be determined as a percentage of the scoring range in your studio section. The person owing the least will get 2 points. The person owing the most will get 0 points. All other scores come from a linear interpolation between these values.

2.5.3 Small Bail Out: Your earnings will be ranked against teams in all studio sections. The maximum score is 2; the minimum score is 0.

2.5.4 Medium Bail Out: Each team will compete several times. The sum total earnings from all tests will be used to rank the teams within the studio section. The maximum score is 2; the minimum score is 0.

2.5.5 Big Bail Out: Your points are based on the your machine's winning percentage. The teams with the most wins earn 8 points; the teams with zero wins get 1 point.

2.5.6 Design Review: The judge's scores will be summed and divided by the number of judges that evaluate each machine. These average scores will be ranked across all sections. The maximum score is 5 points; the minimum score is 1 point.

3. Detailed Design Requirements

1. If a team is disqualified for a rules violation, then they lose the current test in which they are competing. If the team can eliminate the violating offense, then they are eligible for future tests.

2. For Big Bail Out tests, your device will be assigned to a 7-minute time block. All competing devices will be automatically activated at the 4-minute mark, and must be removed from the track by the 7-minute mark. Thus, you will have 4 minutes to setup your device and then it will compete for 1 minute. The next two minutes will be used for scoring and cleaning up. By the end of the 7-minute period, you must remove your device (and any bits and pieces), return the supplied balls, and clean up the arena. Disqualification can be imposed for taking longer than your allotted time.

3. Once your device has been activated, you may not touch the device or enter the competition area until the field official indicates it is time to clear out your machine. Doing so results in a disqualification.

4. It is your responsibility to be on time with a working machine. If you are not present during your assigned time, you are disqualified for that test.

5. The source of power in your device is limited to the five mousetraps provided to you, a compressed-air tank provided to you, the controller box power, and gravity. You may replace the mousetraps with exactly the same model if they break.

6. The only permitted actuators are those supplied to you by the ME 2110 staff.

7. Your machine must fit within a 24 x 12 x 18 (length x width x height) inch box. The 12-inch dimension describes either the width or the length of the device. The 18-inch dimension is the maximum starting height of your system. Your device will be measured with a go/no-go box during the 4-minute setup period. When the box is removed, your machine may not "bloom" out and occupy a larger volume. Doing so will require a reboxing of the machine. If your machine has not been cleared to compete by 15 seconds before the trigger time, you will be disqualified for that test.

8. The device must be launched from within the 2.5 X 2.5 foot starting area outside each home zone. The outside of the lumber perimeter defines one side of the starting area. You may place your device in any configuration or orientation within the starting area; however, the go/no-go box must be able to fit over the device prior to its start. You can only reposition your device after it has been checked for size; you cannot set triggers, adjust components, turn on your controller, etc. Your machine cannot overhang into the competition area - defined by the outside of the 2x4's.

9. A three-foot perimeter around the arena, marked off by tape, will be off limits during the competition.

10. The device must be safe. It must not have the potential to injure bystanders or yourself. It must not damage, stain, or permanently change the competition area or its surroundings. It must not scratch the floor. The faculty will disqualify any device they deem unsafe.

11. Each team may not spend more than a total of \$100 on the device. You will be required to document the cost of your materials by submitting your receipts, as well as a table of materials and costs in your final report. Material may be prorated for costs. The cost of an object is defined to be that which Joe P. Citizen must incur in obtaining the object. For donated or scrounged material, an equivalent price must be specified.

12. The cost of the kits supplied to you is NOT included in the \$100. The \$100 is out of pocket expense. The School will not reimburse you for the expense.

13. The cost of any aesthetic materials (*e.g.*, paint) and fasteners (*e.g.*, staples, tape and glue) are not included in the \$100 budget.

14. All supplies provided to you (electronics, motors, etc.) must be returned in good working order at the end of the term. **No exceptions!**

15. The device shall not be permanently bonded in any manner to the competition track or its surroundings in any way.

16. The device must be activated by using the start plugs near each starting area. The start plug circuits will be closed during the 1-minute competition, and open otherwise. Your control code must sense the closed circuit and activate its actions.
17. Power to the computer will be available from outlets near each starting area. If your computer travels far out into the competition area, you must supply your own extension cord.
18. The device must shut down (i.e., no electric motor operating) at the end of the one-minute competition when the start-plug circuits are opened. Failure to do so will result in a disqualification.
19. The device must operate autonomously. No remote control is allowed.
20. The device may touch or otherwise utilize any part of the arena or its surroundings. It may not utilize or interact with any living person or living object, such as trained monkeys, during the competition.
21. False starts that disrupt the arena such that it cannot be reset in time for the scheduled start will result in a disqualification of the offending device.
22. While machines may go outside of the arena, there are no guarantees as to what will be located outside of the track, *e.g.*, a wall or motor or people may be located outside of the track area.
23. The faculty will assign the teams. The teams will remain constant for the duration of the project. The faculty has the right to remove or otherwise penalize disruptive members of any team.
24. Wanton destruction of the opposing devices and/or the course is prohibited.
25. If you don't play, you can't win. If your device does not make any perceptible movement, then you lose that round of competition or score the minimum possible points if this occurs in a preliminary competition.
26. Swearing, spitting, vulgar scratching, or other rude behavior at the competition will result in disqualification.
27. The faculty's rulings on any clarification or dispute of these rules are binding and final.