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ABSTRACT

The Project aims to put in force sustainable systems of waste collection, segregation, and treatment along with

a controlled, systematic and creative ways of reducing waste generation across the country. These practices

attract lot of public and academicians objection in view of open dumping of garbage. Waste management is an

important as it impacts health, environment and aesthetic society if it is not managed properly. Hence to

improve quality and standard of living in the state, the Government of Andhra Pradesh (GoAP) has proposed

to strengthen the Municipal Solid Waste Management system covering collection, segregation, recycling,

transportation, processing and disposal with option for composting, waste to energy, disposal in all 110 urban

local bodies (ULBs) in Andhra Pradesh, which is in line with national objective of SWATCH BHARATH

MISSION, a prestigious project of Govt of India. The Swachh Bharat Mission (SBM) emanates from the

vision of the Government articulated in the address of The President of India in his address to the Joint

Session of Parliament on 9th June 2014: “We must not tolerate the indignity of homes without toilets and

public spaces littered with garbage. For ensuring hygiene, waste management and sanitation across the nation,

a “Swachh Bharat Mission” will be launched. Mishandling of waste can have a variety of consequences on

our every day life. Besides creating an unhealthy and unhygienic living environment, it is responsible for the

spread of diseases, pollution of lakes and water bodies leading to loss of biodiversity and the inefficient use of

land and our resources. It is extremely important that we organize and manage the waste management sector

of our country, which is an infrastructural necessity for all of the other sectors to survive.

This Project aims to organize the collection of Street Waste by setting up trashcans in all public roads .

Introduction to Garbage Collection

1 Design Goals for Garbage Collectors

2 Reachability

3 Reference Counting Garbage Collectors

4 Exercises for Section 7.5

Data that cannot be referenced is generally known as garbage. Many high-level programming languages remove the burden of manual memory management from the programmer by offering automatic garbage collection, which deallo-cates unreachable data. Garbage collection dates back to the initial implemen-tation of Lisp in 1958. Other significant languages that offer garbage collection include Java, Perl, ML, Modula-3, Prolog, and Smalltalk. In this section, we introduce many of the concepts of garbage collection. The notion of an object being "reachable" is perhaps intuitive, but we need to be precise; the exact rules are discussed in Section 7.5.2. We also discuss, in Section 7.5.3, a simple, but imperfect, method of automatic garbage collection: reference counting, which is based on the idea that once a program has lost all references to an object, it simply cannot and so will not reference the storage.

1. Design Goals for Garbage Collectors

Garbage collection is the reclamation of chunks of storage holding objects that can no longer be accessed by a program. We need to assume that objects have a type that can be determined by the garbage collector at run time. From the type information, we can tell how large the object is and which components of the object contain references (pointers) to other objects. We also assume that references to objects are always to the address of the beginning of the object, never pointers to places within the object. Thus, all references to an object have the same value and can be identified easily.

A user program, which we shall refer to as the mutator, modifies the col-lection of objects in the heap. The mutator creates objects by acquiring space from the memory manager, and the mutator may introduce and drop references to existing objects. Objects become garbage when the mutator program cannot "reach" them, in the sense made precise in Section 7.5.2. The garbage collector finds these unreachable objects and reclaims their space by handing them to the memory manager, which keeps track of the free space. Unsafe languages, which unfortunately include some of the most impor-tant languages such as C and C + + , are bad candidates for automatic garbage collection. In unsafe languages, memory addresses can be manipulated arbi-trarily: arbitrary arithmetic operations can be applied to pointers to create new pointers, and arbitrary integers can be cast as pointers. Thus a program theoretically could refer to any location in memory at any time. Consequently, no memory location can be considered to be inaccessible, and no storage can ever be reclaimed safely.In practice, most C and C + + programs do not generate pointers arbitrarily, and a theoretically unsound garbage collector that works well empirically has been developed and used. We shall discuss conservative garbage collection for C and C + + in Section 7.8.3.

Performance Metrics

Garbage collection is often so expensive that, although it was invented decades ago and absolutely prevents memory leaks, it has yet to be adopted by many mainstream programming languages. Many different approaches have been pro-posed over the years, and there is not one clearly best garbage-collection algo-rithm. Before exploring the options, let us first enumerate the performance metrics that must be considered when designing a garbage collector.• Overall Execution Time. Garbage collection can be very slow. It is impor-tant that it not significantly increase the total run time of an application. Since the garbage collector necessarily must touch a lot of data, its perfor-mance is determined greatly by how it leverages the memory subsystem.

• Space Usage. It is important that garbage collection avoid fragmentation and make the best use of the available memory.

Pause Time. Simple garbage collectors are notorious for causing pro-grams — the mutators — to pause suddenly for an extremely long time, as garbage collection kicks in without warning. Thus, besides minimiz-ing the overall execution time, it is desirable that the maximum pause time be minimized. As an important special case, real-time applications require certain computations to be completed within a time limit. We must either suppress garbage collection while performing real-time tasks, or restrict maximum pause time. Thus, garbage collection is seldom used in real-time applications. Program Locality. We cannot evaluate the speed of a garbage collector solely by its running time. The garbage collector controls the placement of data and thus influences the data locality of the mutator program. It can improve a mutator's temporal locality by freeing up space and reusing it; it can improve the mutator's spatial locality by relocating data used together in the same cache or pages.

Some of these design goals conflict with one another, and tradeoffs must be made carefully by considering how programs typically behave. Also objects of different characteristics may favor different treatments, requiring a collector to use different techniques for different kinds of objects.

For example, the number of objects allocated is dominated by small objects, so allocation of small objects must not incur a large overhead. On the other hand, consider garbage collectors that relocate reachable objects. Relocation is expensive when dealing with large objects, but less so with small objects.

As another example, in general, the longer we wait to collect garbage in a trace-based collector, the larger the fraction of objects that can be collected. The reason is that objects often "die young," so if we wait a while, many of the newly allocated objects will become unreachable. Such a collector thus costs less on the average, per unreachable object collected. On the other hand, infrequent collection increases a program's memory usage, decreases its data locality, and increases the length of the pauses.

In contrast, a reference-counting collector, by introducing a constant over-head to many of the mutator's operations, can slow down the overall execution of a program significantly. On the other hand, reference counting does not cre-ate long pauses, and it is memory efficient, because it finds garbage as soon as it is produced (with the exception of certain cyclic structures discussed in Section 7.5.3).

Language design can also affect the characteristics of memory usage. Some languages encourage a programming style that generates a lot of garbage. For example, programs in functional or almost functional programming languages create more objects to avoid mutating existing objects. In Java, all objects, other than base types like integers and references, are allocated on the heap and not the stack, even if their lifetimes are confined to that of one function invocation.

Chapter 2: Literature survey

India is known as one of the most heavily settled countries in the world. It appears to be the second country to

have the highest number of residents. With the total population of about expected data 1.37 billion in 2019.

The management of Municipal Solid Waste (MSW) in India has encountered problems. Each year, the

population grew by 3–3.5%, as this factor arises, the rate of solid waste generation also rise up to 1.3% in

Aligarh city, Uttar Pradesh a large number of ingenious factors like, rapid urbanization, rapid population

density, rapid commercialization, uneven living standards and also enlargement of industrialization has

created destructive consequences in terms of biodegradable and non-biodegradable waste generations which

are estimated at about 415 tons per day.

Let us keep our city clean"

In recent years fast population growth, increase in urbanization and industrializa-tion in India has created

severe problems for solid waste management in cities. Theincreased level of consumption characteristics of

the population of cities lead to gen-eration of enormous quantities of solid waste material. The impacts of such pollutionare felt both at local, as well as, at distances from sources. Domestic and industrialdischarges lead to

contamination of air, eutrophication with nutrient and toxic materialswhich in turn lead to degradation of air,

land and affect flora and fauna badly. Sinceolden times municipal bodies remained responsible for keeping the

roads clean, collectcity garbage and to carry out its safe disposal. Most of the elected bodies of the Indiancities

employ largest number of employees for the purpose of cleaning the city, butonly 50–70% of the waste

generated is collected by the staffkeeping aside the tendencyof nonworking of the employees. Many estimates

of solid waste generation areavailable but on the average it is projected that under Indian conditions the

amount ofwaste generated per capita will rise at a rate of 1–1.33% annually (Shekdar 1999).The traditional

routine approach to solid waste management isnormally municipal bodies handle all aspects of collection,

transport and disposal andthis has emerged as a reality of mixed success all over the world in advanced

ordeveloping cities. The search for more efficient and economical solid waste collectionagenda in most of the

urban areas has taken shape adopting several directions towardsbetter partnership with communities along

with private sector combining adequateeconomic policies, e.g., recycling credits by paying the recycler, landfill disposallevies at land-fill sites designed to minimize the quantity of waste being land-filled andproduct

charges like packing tax to disallow over-packaging. Cities have a wide varietyof arrangement under their

control to lessen environmental burdens. Legal approachand restrictions on the quantity of pollutants a factory can discharge of minimum airand water quality standards are being particularly proved effective in monitoring

pol-lution in many parts of the globe. The efficiency depends mainly on good enforcementcapacities and

proper monitoring procedures where urban growth pressures and pol-lution issues are far greater.

Following the onset of industrialisation and the sustained urban growth of large population centres in England,

the buildup of waste in the cities caused a rapid deterioration in levels of sanitation and the general quality of

urban life. The streets became choked with filth due to the lack of waste clearance regulations.[19] Calls for the

establishment of a municipal authority with waste removal powers occurred as early as 1751, when Corbyn

Morris in London proposed that "... as the preservation of the health of the people is of great importance, it is

proposed that the cleaning of this city, should be put under one uniform public management, and all the filth

be...conveyed by the Thames to proper distance in the country

Allocate memory for the type that represents the resource.

Initialize the memory to set the initial state of the resource and to make the resource usable.

Use the resource by accessing the instance members of the type (repeat as necessary).

Tear down the state of the resource to clean up.

Free the memory.

This seemingly simple paradigm has been one of the major sources of programming errors. After all, how many times have you forgotten to free memory when it is no longer needed or attempted to use memory after you've already freed it?

These two bugs are worse than most other application bugs because what the consequences will be and when those consequences will occur are typically unpredictable. For other bugs, when you see your application misbehaving, you just fix it. But these two bugs cause resource leaks (memory consumption) and object corruption (destabilization), making your application perform in unpredictable ways at unpredictable times. In fact, there are many tools (such as the Task Manager, the System Monitor ActiveXÂ® Control, CompuWare's BoundsChecker, and Rational's Purify) that are specifically designed to help developers locate these types of bugs.

As I examine GC, you'll notice that it completely absolves the developer from tracking memory usage and knowing when to free memory. However, the garbage collector doesn't know anything about the resource represented by the type in memory. This means that a garbage collector can't know how to perform step fourâ "tearing down the state of a resource. To get a resource to clean up properly, the developer must write code that knows how to properly clean up a resource. In the .NET Framework, the developer writes this code in a Close, Dispose, or Finalize method, which I'll describe later. However, as you'll see later, the garbage collector can determine when to call this method automatically.

Also, many types represent resources that do not require any cleanup. For example, a Rectangle resource can be completely cleaned up simply by destroying the left, right, width, and height fields maintained in the type's memory. On the other hand, a type that represents a file resource or a network connection resource will require the execution of some explicit clean up code when the resource is to be destroyed. I will explain how to accomplish all of this properly. For now, let's examine how memory is allocated and how resources are initialized.

RESOURCE ALLOCATION

The MicrosoftÂ® .NET common language runtime requires that all resources be allocated from the managed heap. This is similar to a C-runtime heap except that you never free objects from the managed heapâ "objects are automatically freed when they are no longer needed by the application. This, of course, raises the question: how does the managed heap know when an object is no longer in use by the application? I will address this question shortly.

There are several GC algorithms in use today. Each algorithm is fine-tuned for a particular environment in order to provide the best performance. This article concentrates on the GC algorithm that is used by the common language runtime. Let's start with the basic concepts.

When a process is initialized, the runtime reserves a contiguous region of address space that initially has no storage allocated for it. This address space region is the managed heap. The heap also maintains a pointer, which I'll call the NextObjPtr. This pointer indicates where the next object is to be allocated within the heap. Initially, the NextObjPtr iset to the base address of the reserved address space region.

An application creates an object using the new operator. This operator first makes sure that the bytes required by the new object fit in the reserved region (committing storage if necessary). If the object fits, then NextObjPtr points to the object in the heap, this object's constructor is called, and the new operator returns the address of the object.

Early waste disposal

In ancient cities, wastes were thrown onto unpaved streets and roadways, where they were left to accumulate. It was not until 320 BCE in Athens that the first known law forbidding this practice was established. At that time a system for waste removal began to evolve in Greece and in the Greek-dominated cities of the eastern Mediterranean. In ancient Rome, property owners were responsible for cleaning the streets fronting their property.

Developments in waste management

A technological approach to solid-waste management began to develop in the latter part of the 19th century. Watertight garbage cans were first introduced in the United States, and sturdier vehicles were used to collect and transport wastes. A significant development in solid-waste treatment and disposal practices was marked by the construction of the first refuse incinerator in England in 1874. By the beginning of the 20th century, 15 percent of major American cities were incinerating solid waste. Even then, however, most of the largest cities were still using primitive disposal methods such as open dumping on land or in water.

Composition and properties

The sources of solid waste include residential, commercial, institutional, and industrial activities. Certain types of wastes that cause immediate danger to exposed individuals or environments are classified as hazardous; these are discussed in the article hazardous-waste management.

Generation and storage

Rates of solid-waste generation vary widely. In the United States, for example, municipal refuse is generated at an average rate of approximately 2 kg (4.5 pounds) per person per day. Japan generates roughly half this amount, yet in Canada the rate is 2.7 kg (almost 6 pounds) per person per day. In some developing countries the average rate can be lower than 0.5 kg (1 pound) per person per day. These data include refuse from commercial, institutional, and industrial as well as residential sources. The actual rates of refuse generation must be carefully determined when a community plans a solid-waste ma
Collecting and transporting

Proper solid-waste collection is important for the protection of public health, safety, and environmental quality. It is a labour-intensive activity, accounting for approximately three-quarters of the total cost of solid-waste management. Public employees are often assigned to the task, but sometimes it is more economical for private companies to do the work under contract to the municipality or for private collectors to be paid by individual home owners. management project.

If the final destination of the refuse is not near the community in which it is generated, one or more transfer stations may be necessary. A transfer station is a central facility where refuse from many collection vehicles is combined into a larger vehicle, such as a tractor-trailer unit.

Composting

Another method of treating municipal solid waste is composting, a biological process in which the organic portion of refuse is allowed to decompose under carefully controlled conditions. Microbes metabolize the organic waste material and reduce its volume by as much as 50 percent.

RESULT ANALYSIS

Many residents anger themselves at the apparent inability and/ or unwillingness of some to adher to collection schedule

Various residents have witnessed a number of "so-called temporary residents" and tourists leave their bags outside on the wrong day and / or in the wrong place. Despite being friendly informed that Malta dictates otherwise, these "visitors" just shrugged their shoulders and did nothing to correct their behaviour.

Others angered themselves at some people's seeming inability to stick to schedule and or contents /bag.

Alternative facilities are necessary for tourists, temporary residents and residents leaving the country.

Good planning and proactivity are just as essential in this part of your vacation as they have been all along. It begins by reducing the amount of waste to be disposed off at the last moment.

When that moment arrives Malta offers you the following facilities:

Recycables (grey / green bag) can be disposed off at a civic amenity (CA) site but have to be sorted out beforehand into paper / plastic / metal / packaging. In other words the recycables cannot be disposed off in one container. Glass can also be brought to CA site.

Mixed waste (black bag) can be brought to CA site provided it does not contain any food. Note that food belongs in the organic bag!

Organic bags cannot be brought to a CA site, for this you will have to make alternative arrangements yourself like asking a neighbour or the owner of the appartment / B&B where you have stayed

Present schedule does not meet requirements

Residents with babies and cats report that their mixed waste (black) and recycable (grey/green) bags fill within a day; in other words, the present schedule does not meet their requirements.

Tip: Kindly go through the three R's (Reduce, Re-use and Recycle) and think of possible ways you can diminish your waste: be creative and think out of the box! Report your successes to others so that they can benefit too.

Vulnerable organic bags

The organic (white) bag is flimsy and tears easily. When the white bag contains fish, meat and /or bones, cats and rats are attracted to it, tearing the white bag apart and littering the environment which in turn attracts rats and flies. Coupled with the windy weather this is an issue for both our health and our environment.

Tips:

Wrap fish/meat/bones carefully in newspapers before placing them in the white bag

Try making your own compost (wormery if you live in an appartment) and "usual" compost / "worm castings" / both if you have a garden with plenty of space. Composting will decrease your amount of organic waste, but above all, composting enriches the soil, renders plants healthier and better able to ward off disease, and can prove a rewarding hobby to self and the environment.

In the summer months residents can place "organic contents" in the deep freezer and get them out of the freezer and into the organic bag on the day of collection.

Keeping our own pavement clean especially when organic bags have spilled over or the wind has been at play is something all of us can do.

What to do with

Mixed waste that is neither small nor bulky and

A bag of garden waste when you do not own a car

Call Marsaskala Local Council (telephone number 21637171) to avail yourself of the Bulky Refuse Service, offered free of charge. Check also https://www.wasteservmalta.com/bulkywaste

Depending on composition of your garden waste:

Rotten fruit and vegetables, fruit and vegetable peels, leaves and flowers go into the organic bag, branches do not – branches go to a Civic Amenity (CA) site.

Bundle large stems – devoid of leaves – and about one meter in length together with a string or rope. If you do not have a car or are disabled, call Marsaskala Local Council to check whether your bundle can be collected by the Bulky Refuse Service. If not try to find a neighbour or other resident who can and is willing to help you out.

Again here think of making your own compost!

CONCLUSION

Waste management can be defined as the "collection, removal, processing, and disposal of materials considered waste" (Ecolife Dictionary). Waste can be put into landfills, incinerated, recycled, or composted. The most sustainable way to manage waste is to recycle and compost.

In our research, we looked at how well informed the students at Carleton University are on recycling, as it is an important part of waste management. We decided to ask questions to do with things such as if being more informed would effect their recycling habits, and if they know where to recycle used batteries.

Carleton students had some trouble deciding which items belong in which recycling bin (paper products, plastics, glass). They also generally thought that knowing more about waste management would encourage them to recycle more. These results can be interpreted as a need for educating people more about recycling, why it is important, and how it works.

After conducting our surveys, monitoring recycling bins, and speaking to various businesses on campus we have concluded that as a whole, Carleton University has a lot of work to do. We determined that Carleton students not only believed that they are not properly educated on the topic of recycling, but also state that they would recycle more if given the opportunity. There is not a big enough emphasis on the importance of recycling for not only the university but for the planet as well. It is hard to believe that after being quizzed on certain items, that university educated students still struggle with determining which products go in which bins! There are many people who know the importance of recycling but do not do anything about it. People are living in denial about the future, and we believe it is our job to help to inform the public and get people to start thinking about it!

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Our recommendations specifically to Ottawa, but also most of Canada, would be to educate children from when they are young on the effect and importance of recycling. They will feel good to know they are helping the world and each other, and hopefully continue these good practices as they grow up. In theory, they will teach their children to take care of the earth through proper waste management, and it will continue through the generations. We would hope that children and even adults are taught to not only recycle, but reduce and reuse as well.

For adults, it would probably be beneficial to educate them on the cost benefits, for things like continuing to use their electronics until they no longer work, rather than buying a new version every year. We would like to recommend people pay attention before buying an item as well, to avoid things that are over-wrapped, contain a lot of plastics, etc. We would like to see more recycling of items like tires, electronics, and hazardous wastes, and this will come from education and easy access to disposal sites.

In the future, we would like to see the government get involved in incentives for recycling in the Ottawa community.

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