

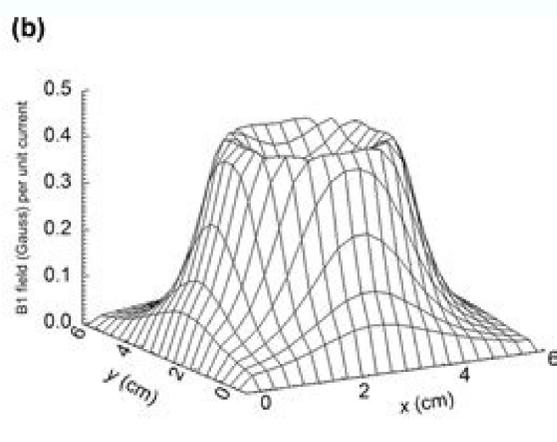
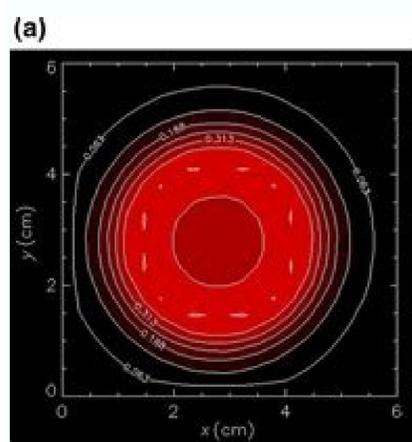
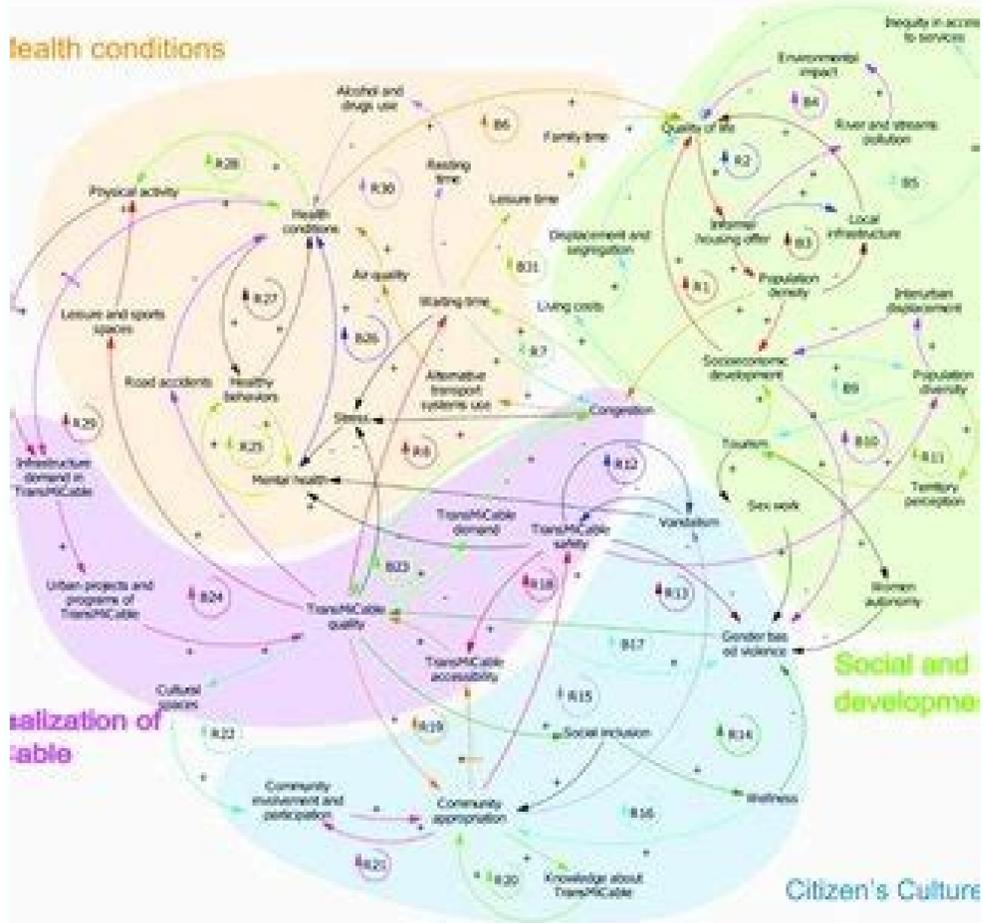


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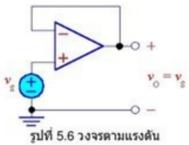


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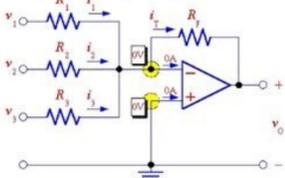


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รูปที่ 5.6 วงจรตามแรงดัน

วงจรรวมผลบวก (Summing Amplifiers)



รูปที่ 5.7 วงจรรวมผลบวก

KCL ที่โหนดอินพุตของออปแอมป์ :

$$i_1 + i_2 + i_3 = \frac{0 - v_o}{R_1} + \frac{0 - v_o}{R_2} + \frac{0 - v_o}{R_3}$$

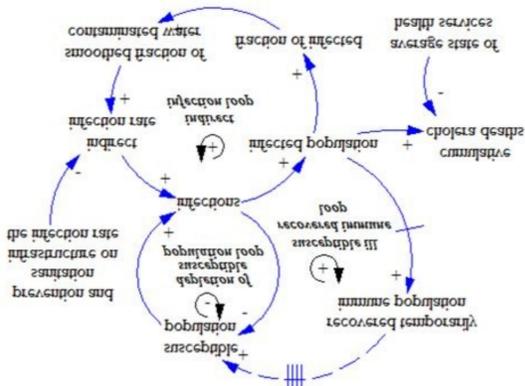
จะได้

$$v_o = -\frac{R_1}{R_1} v_1 - \frac{R_1}{R_2} v_2 - \frac{R_1}{R_3} v_3$$

ถ้า $R_1 = R_2 = R_3$ จะได้

$$v_o = -\frac{R_1}{R_1} (v_1 + v_2 + v_3)$$

จะเห็นว่าวงจรรวมผลบวกมีค่าเอาต์พุตเป็นผลบวกของแรงดันอินพุตแต่ละค่า ซึ่งมีอัตราขยายเป็นลบที่มีค่าเท่ากับค่าความต้านทานที่ใช้ในวงจร



Please leave us a comment if you have any questions or suggestions on how we can make our learning materials more useful! Practice Questions Quiz yourself with the following questions and then check the following section for the answers! 1. In other situations, the relationships are often two way. 5. The following model shows the interaction between cows and the fields they graze. As births increase, population increases; as population increases, births increase. A causal loop diagram is a tool used to describe a complex system. There are many other factors at play. More Grass leads to less Soil Erosion which leads to more New Grass Growth which in turn leads to more Grass... OR Less Grass leads to more Soil Erosion which leads to less New Grass Growth which in turn leads to less Grass. 3. Photo Courtesy: thewildwing/YouTube You'll also want to download your bank's app for online banking on the go. What used to require a bulky check register and monthly paper statement is simplified — now you can take care of your banking needs online. You may even be able to get started with online banking while you're talking to your bank representative. Familiarize Yourself With Your Bank's Online Systems Before you dive too deeply into online banking, familiarize yourself with your bank's online tools. Projects and programmes often have to deal with complexity. As part of systems thinking, causal loop diagrams are useful as the extent and uncertainty of scope increases. Because this type of process deals directly with people's money, security measures must be robust, and most banks have layers of security at work. If you have a bill that never changes every month, you can set it to pay from your bank at a certain time every month. However, as population increases there is a delay before births increase because people have to reach reproductive maturity. Once you set up your online profile and become familiar with your bank's digital services, you'll love the convenience. Account Management Online banking systems allow you to log in through their website and view

your account information. Deposits and Payments Direct deposit is a type of banking that allows you to provide a routing number so money can be transferred into your account automatically. Photo Courtesy: Delta Community Credit Union/YouTube Take the time to call or visit your bank, or double-check that your information is correct. According to CSA Federal Credit Unions, E-statements are guarded by electronic safeguards, and are actually less likely to be obtained by identity thieves than a paper statement sent through the mail. This is a balancing loop. They go in opposite directions - as the actual temperature increases the gap decreases. Check the website's homepage menus to find out how to transfer money between accounts. You can take care of your bills in one sitting or have your bank automatically send payments online without the need for you to input information for each one. You can begin with any variable in this loop either increasing or decreasing and then work your way around. E-statements E-statements, or electronic statements, are your regular bank statements made available online. More inequality leads to more Conflict ... OR less Inequality leads to less Conflict. In fact, though it varies from bank to bank, there are generally few types of transactions or other management actions that cannot be done online with an established account. It is usually described in the context of Systems Thinking. Make sure you can navigate your way around the app; it'll probably look different from the website interface, even if it has the same functionality. These categories can help you know what you're spending most of your money on. This may be the system that is an outcome of a project or programme, or it may be the organisational system that is in place to deliver the objectives. The 'R' symbol within the loop indicates that this is a 'reinforcing loop'. Online bill pay isn't just great for bills, because you can also pay individuals or handle your charitable giving through your bank's website or app. How would you read it out loud? Somebody uses the following causal relationship in a model about traffic. Photo Courtesy: Anna Shvets/Pexels You can even automate certain payments that you know will be consistent. For example, employers often use direct deposit to automatically deposit paychecks. In words what does it say? Most banks require customers to confirm information via text, email or phone call, so it's essential to make sure that you have the most up-to-date information on file. Having the right information on file with your bank will not only increase your peace of mind, but it will also make setting up online banking easier. Navigating your way around the online banking website can change the way you manage your finances. As part of systems thinking, they can be used to model complex systems. Look around the bank's website, and, if possible, take a virtual tour of the features of online banking. Conversely, as population increases, deaths increase. Find out what page to visit to see what's coming into and going out of your bank account. In a causal loop diagram, it's worth noting here that if you trace any loop, an even number of minuses creates a reinforcing loop and an odd number of minuses creates a balancing loop.A diagram such as this is heavily dependent upon context (in this case a developing economy), and will incorporate assumptions or justifiable propositions depending upon the data available. Photo Courtesy: Resolute Capital - Finance Videos/YouTube Categorizing your expenses this way can help you with your budgeting; you can see at a glance how much of your money goes to specific things. You can also track and manage any fees that your bank charges you. As death increases, then population decreases (these move in opposite directions). These factors move in the same direction and so are labelled with a '+'. This is an electronic deposit done online. Online banking offers you a quick and convenient way to manage your money. This relationship is shown in this way: Importantly, the '+' signs do not indicate that the interest is 'added' to the balance, or the balance is 'added' to the interest. These examples constitute a brief introduction to causal loop diagrams. This is a Reinforcing Loop because an initial increase in the starting variable led to a further increase down the line. Since more Grass leads to more Grass or less Grass leads to less Grass. If you're on the fence about trying online banking, you'd be surprised at how easy it is to figure out. Debit Cards Debit cards work like credit cards except that they automatically withdraw money from your bank account, and are one of the most common types of online banking transactions. It is referred to as a 'balancing loop' and is indicated by the 'B' symbol. For example, say your \$1,200 rent is due on the fifth of each month. In the diagram below, the delays have been added and the two loops have been brought together. The answers are at the end of the post. While causal loop diagrams are useful in complicated projects and programmes, they really come into their own in complex situations where cause and effect are difficult to understand. Of course, human populations cannot be understood by this simple combination of births and deaths. For example, as populations increase in a developing economy, they may have access to fewer resources per person (food, jobs, health care etc.). Population and births move in the same direction and this is a reinforcing loop. It is also possible to set up automatic payments so that you can pay bills and have the amount withdrawn electronically from your account. The effect is that the system strives to reach the goal of the desired temperature. This is therefore labelled with a minus sign (or an 'o' to indicate 'opposite directions'). Photo Courtesy: Andrea Piacquadio/Pexels Technology has made our lives easier in so many ways, which includes a more convenient banking experience. Plus, it may make it easier to track and better allocate your spending. As a result of understanding this simple cause and effect, I'm able to avoid the pain of being burnt. There may be several passwords or log-in codes you have to input to gain access to your account. When you use a debit card, information about the purchase is put into a computer system and then transmitted online to your bank, where the transaction is processed within your account. This type of banking is an easy way to pay recurring bills like utility payments and insurance premiums. Learn how to pay your bills online — with the help of a representative over the phone if that simplifies the process for you. 4-6. In a model about racial tension, you see the following relationship. You can see how your online banking system functions like an old-school check register, and you can view credits and debits without much trouble. MORE FROM ASKMONEY.COM After reading the post on How to Read Causal Loop Diagrams, quiz your self on what you've learned. Get acquainted with looking at your account and figuring out how to check balances. Walk through each feedback loop and determine whether it is balancing or reinforcing. If I touch a flame it will cause pain, so I don't touch flames. Similarly, as population increases, there is a delay before deaths increases. You can also order checks and view check images with this type of banking service. The following feedback loop comes from a model of about how greenhouse gases (GHG) interact with climate change. These factors loop round into the original two birth and death factors that affect population. 4. In this case, a desired temperature is set, for example in an oven. Understanding that complexity is vital for the success of the project or programme. For example, if you want to spend 10% or less of your budget on entertainment, you can view and track how much of your spending goes to that category. 2. This has an impact on life expectancy and desired family size. Overall, online services are a type of banking that opens access to an efficient way to manage your money. In your online banking portal, you may be able to set up a recurring payment to your landlord that transfers the money (or mails out a check) on the first of each month automatically. Walk through the feedback loop verbally and then determine if it is balancing or reinforcing. More Grass leads to more Grass Seeding which leads to more New Grass Growth which become more Grass... OR Less Grass leads to less Grass Seeding which leads to less New Grass Growth which leads to less Grass in the future. You can check your current balance and balance history, initiate transfers between accounts, and view account activity. In your bank's app, you can learn how to deposit checks using your smartphone camera. Use these tips to make the most of managing your bank account online.Make Sure Your Personal Information Is Current With Your BankAs basic as it sounds, you likely won't be able to bank online if your personal information isn't current and on file with your bank. The gap causes the oven to create heat which raises the actual temperature. Answers 1. This would be particularly true in programmes of business change. More Grass leads less Cattle Death which leads to a larger Herd Size which leads to a higher Grazing Intensity which leads to less Grass ... OR Less Grass leads to more Cattle Death which leads to a smaller Herd Size which leads to a lower Grazing Intensity which leads to more Grass. They create another reinforcing loop and another balancing loop. This is a Balancing Loop since more grass leads to less grass over time or less grass leads to more. For example, if the balance in a bank account earns interest and the interest is added to the balance, the result is more interest, and so on. Births and death obviously have an effect on a population. This may be because the objectives of the work are complex and/or because the work is operating in a complex environment. No more writing checks or licking envelopes — your bank sends a payment to the person or company you're paying and tracks this activity on the online banking portal. More Traffic Density leads to a decrease in Speed ... OR less Traffic Density leads to an increase in Speed. For example, more GHG emissions lead to more GHGs in the atmosphere which lead to an increase in Temperature which leads to more Thawing Organic Matter (that was previously trapped frozen in glaciers) which in turn leads to more GHG emissions. Once you've learned your way around your bank's online system, you can master the basics of online banking. The next example starts with a situation that can be complicated but not initially complex. When it's easier to tell that you may be overspending, you can take the necessary steps to scale back on those purchases and allocate more money to savings, for example.Pay Bills Online and Automate Consistent ExpensesAnother helpful feature of online banking is the ability to pay bills from your computer or mobile device. Many banks and credit unions recommend this type of online banking for security reasons. Your bank may even have a way to transfer money to family or friends who use the same bank. Easily accessing your account information this way can help you monitor your spending.Use Online Banking to Organize Your ExpensesMost banks have a handy feature in their online platforms that allows users to categorize expenses for easy organization. This is a Reinforcing Loop. For that reason, 's' is sometimes used instead of '+' to indicate 'same direction'. They mean that the two things move in the same direction, as interest goes up, so does the balance. Humans have evolved to well understand simple cause and effect. These delays are shown by short parallel lines on the corresponding arrows. Another simple example is that of a thermostat. It's useful to understand the behaviour of these systems over time: Over time, a reinforcing loop will increase exponentially, while a balancing loop will seek the goal and plateau at that level. The relationship between the actual temperature and the gap is different. 6. The higher the desired temperature the bigger the gap with the ambient temperature. Many banking systems learn your habits and can intuitively classify your purchases for you once you've set the categories up.

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