Shift4Me
automatic gear shifting

Operating manual v1.0

Introduction

Shift4me is designed to be very simple to use. But “under the hood” there’s a lot going on. Apart from the normal handling, this manual will tell you how to adjust some parameters to suit your preferences such as cadence, gear changing speed and much more.
In this manual we’ll use “DG” as short for Derailleur Gears, so with x-amount of sprockets, and “HG” for Hub Gears, with internal gears in the rear wheel.
Don’t forget to post any comments you may have - positive or negative - or feature requests on the forum of the website.

Taking a ride

The system comes pre-installed with settings that will suit the average cyclist. So once your system is mounted and the battery is charged, you’re good to go.

- Start
  Turn the power on using the Key. You’ll probably hear the servo motor turning to its start position, you’ll also see the LED lighting up. Just get on your bike and start cycling. *If you have DG, don’t put much pressure on the pedals from the start. This is because your chain might not be in the starting sprocket. The chain doesn’t like it much when you put a lot of strain on it while it is not aligned to the right sprocket.*
  When you start cycling, you’ll immediately feel that Shift4Me will try to adjust the gears so that you turn your feet in a comfortable cadence. You’ll hear the buzzer sound when it’s adjusting.
- While riding
  In fact, you just have to cycle and the system will make sure you’re in the right gear. However, if you understand how the system works, you’ll be able to understand some of the behaviour and to (optionally) fine-tune it to your preferences.
  Shift4Me is constantly monitoring your cadence. So when you turn a slow cadence, it’s assuming you’re going uphill or facing some (aarrr!) wind resistance. So it will change to a lighter gear to get a nice, moderate cadence. The same with the opposite: when turning a fast cadence, the system assumes you’re having no trouble at all to turn the pedals, so it will put you in a heavier gear to gain speed.

What if you are really going steep downhill? Most cyclists will stop turning their pedals and enjoy the effortless ride. No problem with Shift4Me: it will recognize you have stopped pedalling and will do the same (nothing…).
If you're the sporty type of rider, you sometimes might like to lift from your seat and do a little sprint. At that moment, you'll want to avoid that the Shift4Me will change gears. Use the button (release it when you hear the buzzer-beep) to "bypass" the system for 5 seconds.

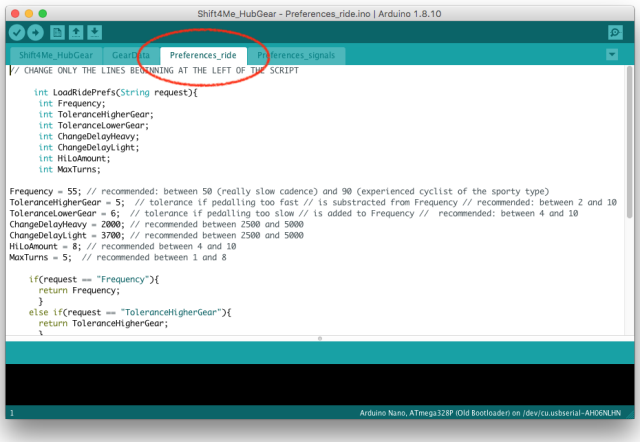
- Stopping during your trip
  If you're cycling in city areas, you'll probably have to stop frequently for traffic lights and those other utilisers of the road (please do not mock them for not having a Shift4Me-equipped bike - stay polite). The system will recognise when you're "stalling" and will do nothing. When you restart your ride, it will hold action for a bit. This is to avoid unwanted gear shifting while restarting your ride.
  But Shift4Me has no way of telling that you have stopped pedalling (on that downhill) or you have stopped for the street-crossing granny. This is where the reset-button comes in: it is very comfortable to be in a light starting gear after a full stop. The reset function is activated by the button (hold it for 2 seconds - that is until you hear the second buzzer-beep). On HG, you can reset while standing still. On DG, it's better to do that while pedalling (so before you come to a full stop). Remember: this reset-action is just optional. You *don't have to* do anything but you *can.*
- Parking or stopping
  It couldn't be easier: just stop your ride. But don't forget to turn the power off...

How far can you go?

The battery has enough power to keep going for a minimum of 5 hours. Because of the minimal design, there's no real way of telling how much the battery is drained. But it will warn you (the LED will flash periodically) when it is time to charge. When it first starts flashing, that means you still will be able to do 30 minutes of cycling. So don't worry, you'll get home without a problem in most cases. If it is flashing constantly, you only have about 10 minutes left.
When the battery is fully drained, the servo will not be able to pull the cable anymore. Your gears will be in their lightest (HG) or heaviest (DG) setting...

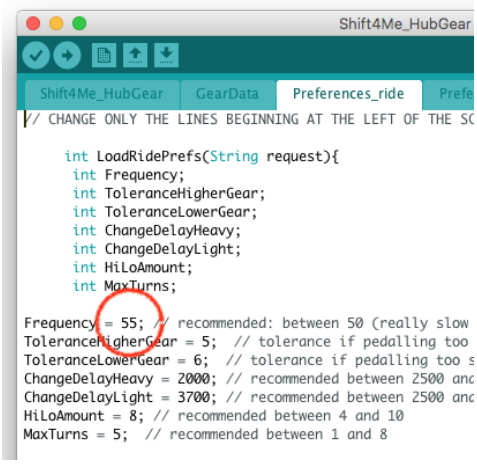
Adjusting preferences

Assuming you have the Arduino IDE installed on your computer (or you're using the web-version): open your personal script for your Shift4Me system.
Click the "preferences-ride" tab as you see in this pic:



From this moment, be careful: even a small syntax error can make the script unusable. As always, it's a good idea to make a backup copy of your script *before* you start editing.
There are 7 settings you can edit. All of them are located to the far left of the script window. If you try to change anything that is not located there, I can not be held accountable for the consequences… These 7 parameters should be round figures (so don't use commas or full stops) and should end with a semicolon. A double slash can be used (and you see them already in the script) to write comments in the script. What I often do, when adjusting parameters, is to copy the line that I will edit and make it inactive with a double slash. This is kind of a backup in the script itself, and makes it easy to revert to old settings.

1. "Frequency"
   This is your preferred cadence. This is the figure the system aims for, the rotations per minute your feet turn while cycling. Without a doubt, this is the most important parameter. See the pic below… You'll see the other parameters following.



2. “ToleranceHigherGear”
   Because there has to be a tolerance for the cadence (how long you think you can keep it up, turning *exactly* 55 RPM?) you can adjust this. I found out during testing that it is great to have a separate figure for the tolerance change-to-a-lighter-gear than the other way, so there are 2 parameters for this. So for example you set your *Frequency* to 55, and your *ToleranceHigherGear* to 5, the system will only put you in a lighter gear if you’re turning less than 50 RPM. If you set *ToleranceHigherGear* to 8, it will react if you’re doing less than 47 RPM. You get, don’t you?
3. “ToleranceLowerGear”
   The same as point 2, but for the above limit...
4. “ChangeDelayHeavy”
   Because it would be annoying that the system would react *immediately* once a non-preferred RPM is read by the Sensor, there is a parameter to adjust this. This figure is in milliseconds. It is a parameter that has an effect on how often the system will change gears: if it changes too often, that’s annoying. If it changes not often enough, that’s annoying too...
5. “ChangeDelayLight”
   This ChangeDelay is also separately adjustable for lighter and heavier gearing...
6. “HiLiAmount”
   Please disregard this, that dates from a pre-release version.
7. “MaxTurns”
   This is just a parameter that overrides the ChangeDelay. It is for these rare occasions that you are able to turn the pedals madly fast. When that happens, you don’t want to wait 3 seconds to be in a more comfortable gear: you want the gears changed NOW!

Charging the battery

Take your battery charger. Make sure the plug is center-positive and it is set to “7 cells (8.4V) NiMh”. The more current you allow the faster your battery will be charged. I recommend charging at 500mA.

Make sure your Shift4Me is turned off before you plug the charger into the socket.
When you plug it in your Shift4Me, first go through the “discharge” cycle - see your charger manual to do this. Once that is done, begin charging. (most chargers will automatically start charging once the discharging is done)
Charging will be complete after 8 hours. Then simply unplug the charger from the Shift4Me.

Maintenance

The whole Shift4Me system is reasonably water-proof. But it is not advisable to leave your bike outdoors all year long…. not only for the Shift4Me…
If the system is installed by capable hands, everything should be virtually maintenance-free. Just don’t leave the power on for too long if you’re not cycling, that will possibly kill the battery. When I go shopping, I leave it on because I don’t like shopping. I’m always in and out of the store in like 10 minutes, so I don’t bother to turn the system off for such a short period of time.
After some time of cycling with the system: if you feel that Shift4Me is no longer shifting in the right sprocket of your DG, or it’s shifting in between gears of your HG, then first try to adjust the cable adjusters. In the same way as you would on a non-Shift4Me equipped bicycle. If that doesn’t help, redo the calibrate procedure as described in the Build Manual.