

GOOD PROGRAMMING  
WORKFLOW

# Good Programming Workflow

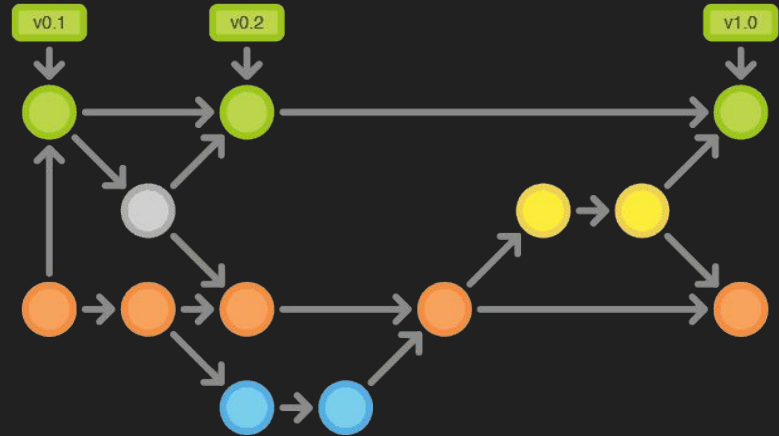
By Mohamed E (1678), Apurva M (1678)

FALL WORKSHOPS

# GOOD PROGRAMMING WORKFLOW

## Outline

- What is Source Control
- Git
- Github and Code Review
- CI Tools
- Resources



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# What is Source Control?

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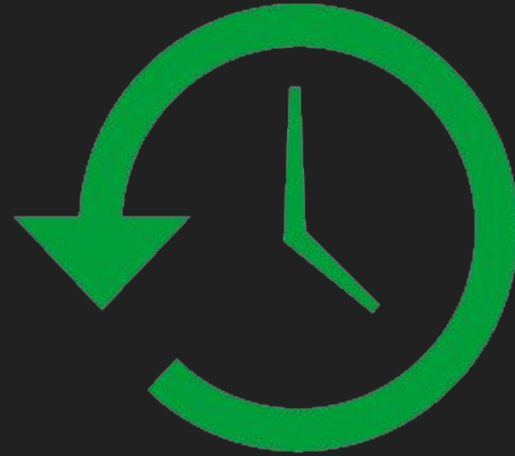
# Source Control

- Way to manage information
  - Code
  - Documents
- Stored in the cloud
- All changes have unique “marker”



## Why Have Source Control

- Keep track of changes
- Restoration points
- Efficient for teams
  - Collaboration
- Branch code



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Git

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## Git

- Tool to manage source control
- Used by most big companies

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## Add, Commit, Push

```
* > Documents > Repos > new_repo > git init
Initialized empty Git repository in /home/mohamed/Documents/Repos/new_repo/.git/
* > Documents > Repos > new_repo > git add file.cpp
* > Documents > Repos > new_repo > git status
On branch master

No commits yet

Untracked files:
  (use "git add <file>..." to include in what will be committed)

    file.cpp

nothing added to commit but untracked files present (use "git add" to track)
* > Documents > Repos > new_repo > git add file.cpp
* > Documents > Repos > new_repo > git commit -m "First cpp file"
[master (root-commit) a029ed7] First cpp file
 1 file changed, 1 insertion(+)
 create mode 100644 file.cpp
* > Documents > Repos > new_repo > git status
On branch master
nothing to commit, working tree clean
```

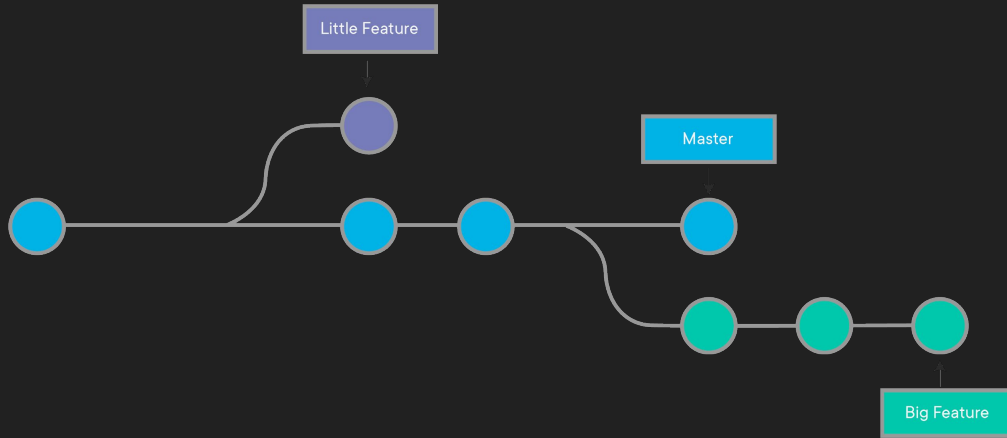
- Add
  - Allows Git to track
- Commit
  - Gives marker
- Push
  - Update remote repo

```
* > Documents > Repos > new_repo > git remote add origin https://github.com/MohamedElm1678/git-demo.git
* > Documents > Repos > new_repo > git push -u origin master
Username for 'https://github.com': MohamedElm1678
Password for 'https://MohamedElm1678@github.com':
Counting objects: 3, done.
Writing objects: 100% (3/3), 224 bytes | 224.00 KiB/s, done.
Total 3 (delta 0), reused 0 (delta 0)
To https://github.com/MohamedElm1678/git-demo.git
 * [new branch]    master -> master
Branch 'master' set up to track remote branch 'master' from 'origin'.
* > Documents > Repos > new_repo > _
```



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## Branches



- Split off from other code
- Use to work on specific or with different versions

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## Clone, Fetch, and Pull

- Clone
  - Copies repo
- Fetch
  - Updates Branches
- Pull
  - Merges with current code

```
work robotics-2019 ➤ git clone https://github.com/frc1678/robot-code.git
Cloning into 'robot-code'...
Username for 'https://github.com': MohamedElm1678
Password for 'https://MohamedElm1678@github.com':
remote: Enumerating objects: 29599, done.
remote: Total 29599 (delta 0), reused 0 (delta 0), pack-reused 29599
Receiving objects: 100% (29599/29599), 48.92 MiB | 294.00 KiB/s, done.
Resolving deltas: 100% (17815/17815), done.
work robotics-2019 ➤ █
```

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# Github and Code Review

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## Github

- Hosts Git Repositories
- Website
- Lots of code there



## Writing a Good Commit Message

- Imperative tense
- Message should be <50 chars
- Use \* in description
- “Title” summarizes changes
- Commit atomically

### Backside switch autos (#619)

```
* Tune scale autos to be more robust
* Right Side needs work
* Increase elevator shoot height
* Increase slow outtake voltage
* Change function names
* Lower slow outtake voltage
* Change function names pt. 2
* Copypasta switch + drive, tune LI only
* ~*~*Formatting*~*~
* Translate other autos to fit other field configurations
* Add more autos to selection
* Add files for new autos
* Add backside switch to runner and BUILD files
* Add backside switch, drive, and none, and tune switch and scale to be nicely mirrored
* Linting fix in autos
* AUTO CHANGES
* Continue to optimize backside switch auto
* Finish with merge conflicts
* Actually finish merge conflicts
* Tune L and R scale
* Lower scale_shoot height
* RR scale auto but its acting kinda funky
```

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## Pull Requests

A screenshot of a GitHub Pull Request list. The header shows 7 Open PRs and 639 Closed PRs. The list includes:

- New log viewer** ✓ #739 opened on May 17 by jishnusen • Review required
- Switch to template literals** ✓ #736 opened on Apr 30 by Daviji • Review required
- New log plotter** ✗ #720 opened on Feb 18 by hardaker • Review required
- Add real clock time to logs** ✗ #719 opened on Feb 17 by EithneA-V • Review required (Labels: P3, bug, needs-changes)
- Add intakes documentation** ✓ #716 opened on Feb 2 by ElspethBair • Approved (Labels: P3, c2019, docs)
- Elevator documentation** ✓ #715 opened on Feb 2 by nathansolomon1678 • Changes requested (Labels: P3, c2019, docs)
- Add comments to wrist c2019 mechanism code** ✓ #714 opened on Jan 30 by nathansolomon1678 • Approved (Labels: P3, c2019, docs)

- Create PR's when feature done
  - Avoids having lots of stuff to review at once
- Try to have all members review code


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## What is Code Review

- Human reading code
- Provide feedback
- Ask questions

```
muan/control/drivetrain_model_test.cpp
```


```
198 + properties.wheel_radius = 3.25 / 2 * 0.0254;
199 +
200 + DriveTransmission::Properties trans_properties;
201 + const double i_stall = 131;
```


 **livyt** on Aug 8, 2018 +😊 ...  
What do these variables/values mean


 **jishnusen** on Aug 8, 2018 Author +😊 ...  
Motor constants, physics constants. More info in headers.

```
c2018/subsystems/score_subsystem/wrist/wrist.cpp Outdated
```

```
43 + void WristController::Update(ScoreSubsystemInputProto input,
44 +                             ScoreSubsystemOutputProto* output,
45 +                             ScoreSubsystemStatusProto* status,
46 +                             bool outputs_enabled = true) {
```

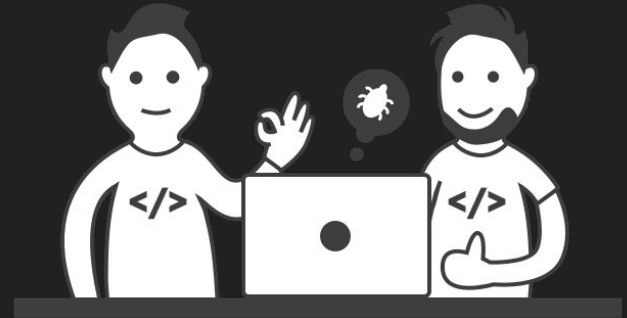
 **livyt** on Jan 28, 2018 +😊 ...  
Outputs enabled shouldn't be true by default...? You read that from the driver station status.

 1

 **livyt** on Jan 28, 2018 +😊 ...  
It should at least be false by default. Maybe outputs\_enabled is read from DS queue in subsystem runner.

## Importance of Code Review

- Catches logic mistakes
  - Ex: Degrees not radians
- Updates members on code
- Learn by explaining code





## Code Review on 1678 (Software Scouting)

- Peer Review
  - Review from a dev not in your app group
- Buddy Review
  - Review from a dev in your app group



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## Code Review on 1678 (Software Robot)

- Two reviews minimum
  - Two veterans at least
- Tests for each PR
- Approval to merge from subteam lead

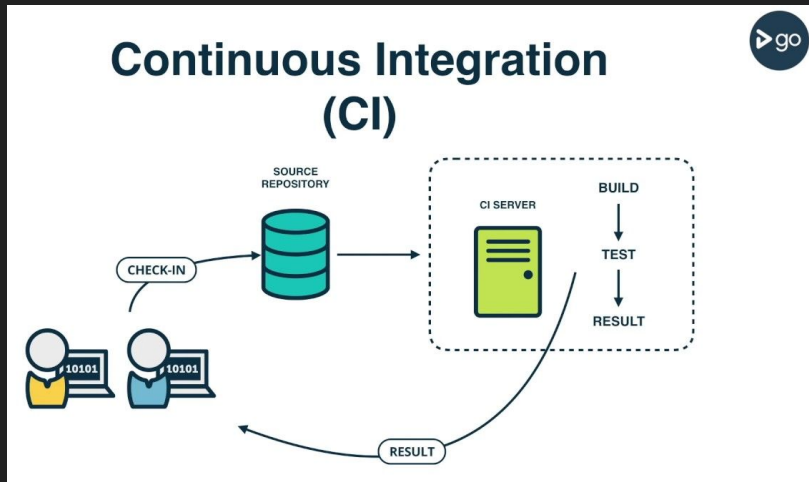


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# CI Tools

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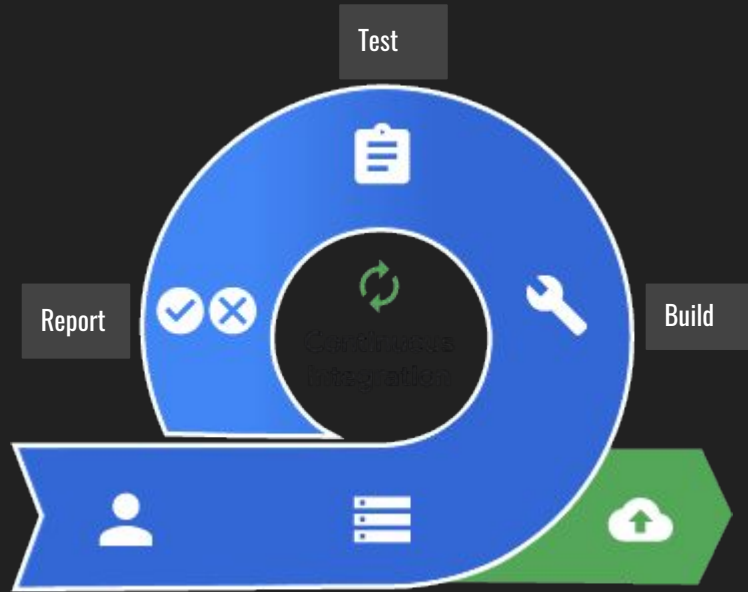
## What is Continuous Integration



- Automated builds and tests
  - Can test styling
- Hosted on a server

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## Why Use CI



- Tests ensure that code will be fine to merge
- Keep uniform styling with style tests

## BuildKite

- Robust webhook support
- Test style and if all tests pass
  - Ex: dt test



# Buildkite

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# Code Practice

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## Naming Conventions

- Continuity
- Uniform
- Collaboration
- Having a Style guide = OP
  - Ex: Google Style Guide

```
// Constants
private static final double kZoomedOutRange = 190.0;
private static final double kZoomedInRange = 220.0;

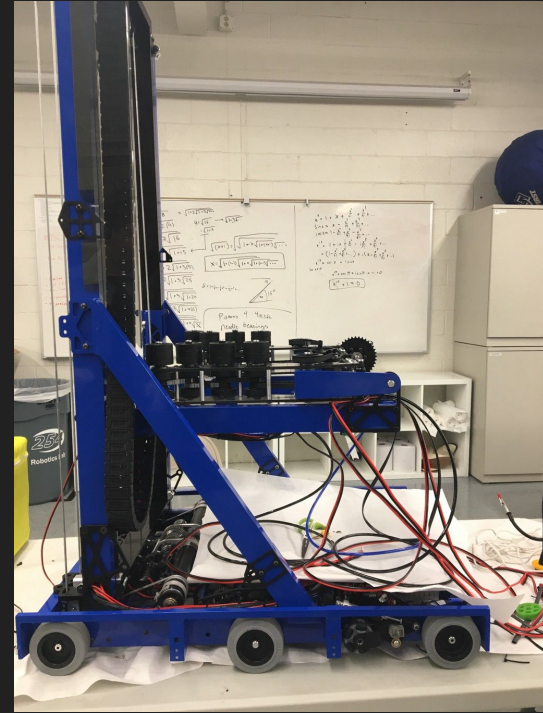
// Instances
private static Superstructure mInstance;

private final Turret mTurret = Turret.getInstance();
private final Shooter mShooter = Shooter.getInstance();
private final Trigger mTrigger = Trigger.getInstance();
private final Hood mHood = Hood.getInstance();
private final Indexer mIndexer = Indexer.getInstance();
```



## Bring-up Process

- Multistep process
- Low-voltage
- Simple logic -> Complicated logic
- Safety



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## Automating Tasks



- Task Efficiency
- Mechanism Reliability
  - Consistency
- Operator Ease
- Removes tasks that are inhumanely possible

## Troubleshooting

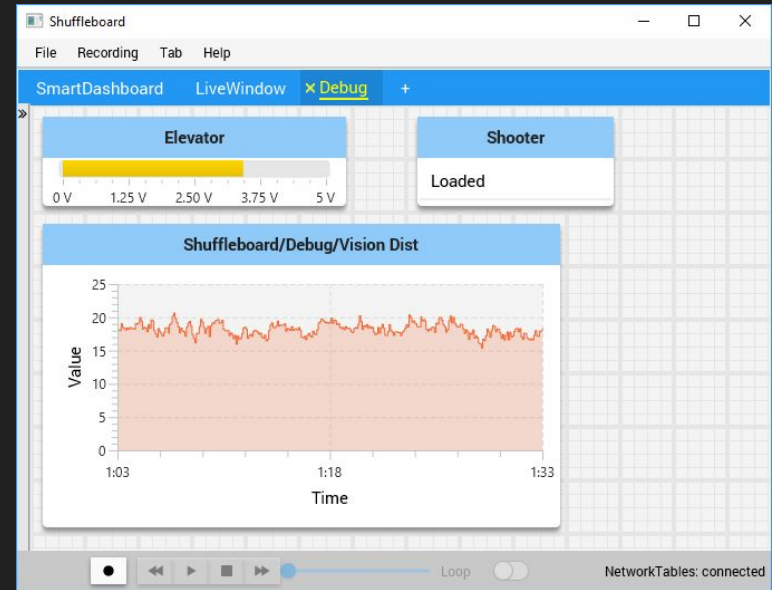
- Trace code
- PRINTS!!!!!!
  - Extremely helpful
- Revert to working copy
- Start over



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## Shuffleboard

- FRC dashboard for viewing data
- Debugging Aid
- Robust



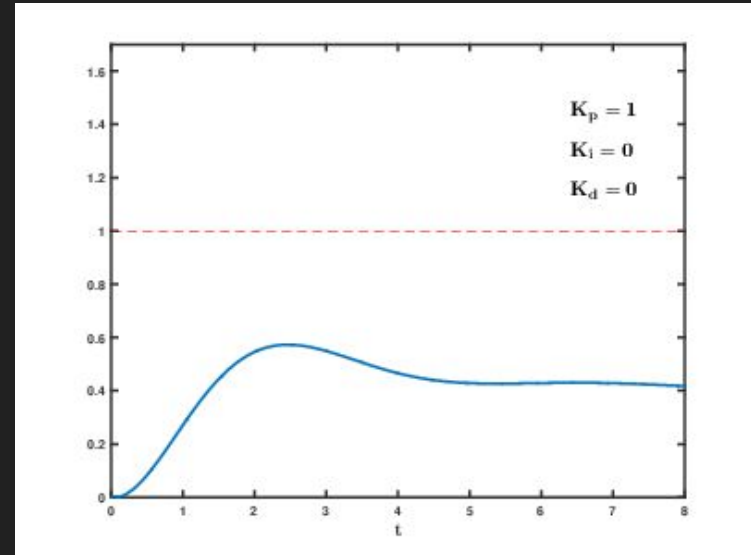
## Documentation

```
/**
 * We can compose Translation2d's by adding together the x and y shifts.
 *
 * @param other The other translation to add.
 * @return The combined effect of translating by this object and the other.
 */
public Translation2d translateBy(final Translation2d other) {
    return new Translation2d(x_ + other.x_, y_ + other.y_);
}
```

- Explicative
- Code comments
  - Clarification
  - Guiders
- Creates a sustainable system

## Implementing Control in Robotics

- PID integration
- Efficiency
- Reliability
- Built into CTRE / REV controllers



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## Team Management

- Communication
  - Transparent
- Task Delegation
- Efficiency
- Documentation

### #2\_software\_robot

★ | 👤 50 | 🌟 1 | ➕ Add a topic

Monday, February 17th



Mohamed El Mashad 10:08 PM

@channel Great job everyone this weekend so much got done and it's another big step in getting ready for our first competition, LAN! 🎉  
Here's a status update of everything that got accomplished this weekend:

#### \*Turret Tuning:

\*The turret is now way smoother than it was at the start of the weekend due to a few things. First of all, it's position PID gains are more tuned ; turret predicts where it should be more aggressively from the drive-train.

\*Soft limits on the turret have been increased from +/- 360 to +/-700 so it doesn't safety reset as often. The safety reset prevents the turret fr

#### \*Beta Bring-up:

\*We tuned the drivetrain constants and code logic to work better with mechanical updates done to the robot

\*The new wheel diameter is 5.67 inches compared to 6 inches on alpha and we also got new measurements for the track width

\*With the new adjustable hood, we had to change the hood constants to allow us to accurately measure distance from the limelight to the targ height of the limelight when the turret is at it's zero position

\*The intake was changed from a neo 550 motor to a falcon 500 motor which allows us to have more power and the way we control it has been

#### \*LED's: \*\*\*

\*With LED's installed, we are utilizing them to give use a visual queue to the robot status and the current LED functionality is as follows:

\*Flashing red when something is wrong with the limelight

\*Rainbow when the robot code has started and nothing is wrong or calibrated

\*Pulsing pink when the turret is calibrated

\*Solid blue when we have a vision target

\*Green when we are looking for a target

#### \*Climber Testing

\*With the climber done, we have been able to test our code on it

\*Controls in climb mode have been updated

\*Stator current limit is placed on the wrangler and climber

\*Experimentation with pneumatic brake and brake mode on the falcons

\*Gave wrangler a ramp rate

\*Automated buddy and solo climb and found height presets to allow for that

\*New Auto Modes/functionality

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# Resources

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## Resources

- Github Resources:

[try.github.io](https://try.github.io)

- Code release:

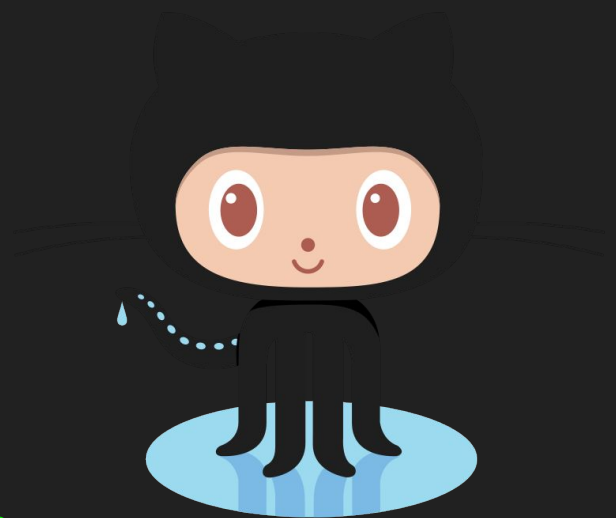
[github.com/frc1678](https://github.com/frc1678)

- Git branching practice

<https://learnitbranching.js.org/>

- Control

<https://blog.wesleyac.com/posts/intro-to-control-part-zero-whats-this>



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Thank You!

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