

Code		Description	Participants who mentioned	Examples
Factors	Bot failure	Recovering from a failure	P3	it comment on issues when it was released and when it was back it create a thousand of comments. So, that is annoying if that happens. That is a big problem. But it is obviously a bug. I mean, it is annoying but it is not intended. [P3]
		Bug	P6, P7, P19	So like, something went wrong with the release process. So it opened up a bunch of different pull requests. And like some of them were a mistake. So my other engineer that had to comment and be like, "Hey, sorry, like, these were a mistake." [P6] The only times I've perceived our bots as noisy is when there's an obvious bug in the state transitions. [P7] (from member checking)
	Unforeseen problem with bot adoption		P3, P10, P21	Or maybe, when you install it for the first time and it will comment on every issue that is open and no longer... but, this is what you want, but it is also a lot of noise for everyone who is watching the repository and they might be upset about it and say "oh, this bot is stupid I will no watch this repository anymore." [P3]
	Bot development	Testing in a real scenario	P2, P12	It [the bot] was in development, but we put it in several repositories to test it. And it caused a very annoying problem. [...] And it broke the process a little bit, it was kind of boring. [P2] We struggle with, like, environments. I guess I would call, which I think is a little bit related to this testing in a real scenario. It's very... especially if your bot is designed to interact with people and other actions in the repository. It's just actually quite hard to do that testing. [P12] (from member checking)
		Bot deployment	P7	And then when we were trying to upgrade the bot, there were two versions running and they got an edit war sending me like 45 emails or something like that. Because they kept moving then ... so bot instance one was moving here and then bot instance two moved it back and advances to this. [P7]
	Bot design	Spam	P4, P16	I didn't give [to the bot] explicit authorization to enter the repository, it generates a notification that you did not request, which is the pull request. [P16] [...] people want to have agency, they want to have choice. [...] They want to know that they are being corrected because they asked to be corrected. So when I asked for you to do code coverage, and you tell me I'm failing my code coverage, I asked for that. [P4]
		Intended behavior	P4, P7, P19	But by default, it also leaves a comment. [P19]
Bot annoying behavior	Verbosity		P1, P13, P17, P19, P21	So the default is it puts a gigantic comment with a treemap on your pull request. People hate that. [P13] And so it has a GitHub integration that posts these rules. really dense and information rich elements to your pull requests. And I've seen it be a lot more distracting than it is helpful. [P17] These bots that are chatty. [P21]
	Frequency and timing of actions	Repetitive actions	P3, P6, P9, P10, P14, P15, P19, P21	sometimes like maybe it's an automation that like runs too frequently or something and then it's like, "oh, it keeps opening up all the pull requests that I don't need or want me to close them [P6] Sometimes we get comments like "hey, bot comments much to my taste" [P9] I guess if dependabot every week opening a bunch of pull requests was annoying before we automated it to then have a bot go close the pull requests. We solve that problem with another bot. [P15]
		Time insensitive	P3, P19	It's very repetitive and it's possibly information dense. [P19] As long as, for example, the comment is immediately after I did a change, for example, when I merge the pull request and probot have the welcome bot and says "hey the pull request was merged", and as long as it happens, if it is in a second or two and I'm seeing the page I do not get a new notification, because I already saw it and I'm still on the page. But if it happens on three minutes later, and I left the page and suddenly I get the new notification and I think "ah, this person has another question or something", so I need to check it out and find out that this is a bot. [P3]
	Performing unexpected actions		P4, P6, P13, P16	So like, something went wrong with the release process. So it opened up a bunch of different pull requests. And like some of them were a mistake. So my other engineer that had to comment and be like, "Hey, sorry, like, these were a mistake." [P6] if you have a project with a lot of bots on there can be a lot of notifications and interactions from that bots. [P12]
	Bots overpopulation		P7, P8, P9, P12, P13, P15, P19, P21	... a bunch of like stupid agents commenting on the pull request ... [P13] Obviously, we might get to the point where there's too many [bots]. And like that will be a problem. [P8] Yeah, because there were 30 different bots. And like each one of them was asynchronously going in. So it was just like, giving us tons and tons of comments. [P19]
Human previous experience		P3, P7, P14, P19	But if you, you know... when it is your self maintained project, and you see these comments everywhere and you can not configure the codecov to turn it off, it might become just noise. [P3] There's other stuff where it's really more for novices or something like [bot] tends to have pretty, pretty dense messages. [P19] Bots are too noisy for me. [P3] since I'm experiencing in bots, I think it's fine, but it can... Some can probably generate a lot of noise as well. [P14] I do worry that newcomers perceive the bots as noisy, even with only 1-2 comments, because the comments are large. [P7] (from member checking)	
Project standards		P8, P9, P14	So if the code is public, then the biggest fear of the public maintaining... maintainers of the bug report is like the bot is not compliant to their standards, right? every public repository has some standards, whether in terms of communication, whether in terms of how many messages the developer should see. And the bot likely will not comply with this policy. [P9] Like, my project isn't that complicated. I know which files I changed. And so if I'm not using it, then there's no point in seeing it. [P8] So, like dependabot and renovate that generate the updates, not all software projects follow the same version and convention sometimes it is easy to get it slightly wrong. It depends... you could set it just to update stable releases, but then you're a bit behind. So you sort of has to be... it's easy to be on like the bleeding edge with bots, I would say. [P14] So, suddenly I would be a 1000 of new notifications just because a bot and it would be very annoying to me because I would know a legitime new notification, something I need to see or a stupid comment from a bot. [P3]	
Information overload	Notification overload		P3, P12, P13, P16	Nobody wants to be notified like 16 times about the pull request, and they'll just unsubscribe. [P13] [...] it creates basically new notifications about things that are not new to me to see [P3] who's not very active on GitHub will get completely overwhelmed by the review process because of all the notifications and they just... [P12]
	Replicate information for maintainers		P3, P8, P10, P13, P17	I remember that codecov was integration and always left comments telling you "oh, the code coverage drop for 1%" or whatever. And it would become noise at times, like... I would prefer not to have the comments, for me as a maintainer I would... Because it replicates information that we already had. [P3] sometimes it's just commenting something that's redundant. [P17] some people don't care to get that extra information. [P8] Miss important comments from humans [P1]
Disruption on the human communication	Miss important information from humans		P1, P10	Before the bots, I could see who was working on the project in an easier way. For large projects it can be confusing, because do I really have several problems or are they just observations of the bots? [P10]
	Difficult to handle the information		P8, P10	As a human, it's difficult to parse through all that data and get something meaningful out of it. [P8] A bot creating a lot of information, following its own patterns [...] To review all this content also takes a while. [P10]
	Interrupt the conversation flow		P13, P19	Because it interrupts. It's like you're talking to the person who submitted the pull request and then a bot comes in and puts other information in the middle of your conversation. [P13] if the bots make just tons of comments and interrupt the conversation on the pull requests, we don't like that. [P13] I think the main problem was that I've ever experienced with bots has been spamming us and drowning out conversations. [P19]
Burden to filter out notifications		P3, P16, P19	I don't want a lot of bot generating noise. I have to filter what is noise and what are important things and what are emergency things. It's like spam from GitHub notifications. [P16] I get an email like tries to grab my attention. Whereas the CI status hook, I will go back, you know, I like to differentiate between a real person is talking to me and here's status information that you need. [P19]	

Disruption on the development workflow	Time spent with non-development tasks	Increase the burden for developers. Also waste developers time.	P5, P16, P20	<p>it [the bot] spends extremely unnecessary time, from a person who is the maintainer of an Open Source package, who often does this voluntarily ... With noise, you know? For me it is a disaster. [P16]</p> <p>Before closing, it comments to ask if the problem is resolved. I then have to respond that it is not resolved. It's bothersome because there's no real progress being made, yet it still takes my time. [P20]</p> <p>It's an annoyance because it wastes our time. Constantly, We have to close it ... we have to see "Oh, this is a PR", "Oh, this is a spam" ... like I waste five minutes determining, determining that it is a spam. [P5]</p> <p>Noise. [P1]</p>
	Noise	Participants mentioned bots introducing noise	P1, P3, P7, P8, P9, P12, P13, P14, P16, P19, P20, P21	<p>Some of them can introduce a lot of noise. [P3]</p> <p>So at some point, they [the bots] might be just too noisy. [P9]</p> <p>Depends on the verbosity of the bot and what it does. [P1]</p>
	Perceived as	[relationship] Some bot behaviors might be perceived as noise	P1, P7, P12	<p>I do worry that newcomers perceive the bots as noisy, even with only 1-2 comments, because the comments are large. [P7] (from member checking)</p> <p>what some people might think of as noise is information to other people, right? Like, it depends on the user's role and context within the project. [P12] (from member checking)</p>
Countermeasures	Stop watching a repository	Contributors stop watching a repository to manage the noise	P8, P13, P19	<p>And I certainly would stop watching. Like, I feel like I would stop watching repositories that got five or 10 dependency upgrades, pull requests every single day, or, you know, unless I had some. I would have to use some sort of aggressive filtering. It might destroy my, like ability to use GitHub notifications, things like that. [P19]</p>
	Re-configuring the bot	Maintainers need to re-configure the bot to avoid noise	P8, P17, P19, P20	<p>A significant nonzero number of them actually turn them [bot comments] off. And they turn them off because for them, it is not the right workflow for them. And so they prefer to, for us to only update status checks. [P8]</p> <p>So typically I'll just turn off those comments entirely. [P17]</p> <p>Re-configuring the bot to lower the frequency of actions. [P20] (from member checking)</p> <p>Sometimes we need to re-configure the bot. [P19] (from member checking)</p>
	Re-designing the bot	Bot developers need to re-designing the bot to avoid noise	P12	<p>So we did effectively redesign the messaging. [P12] (from member checking)</p>